



**US Army Corps  
of Engineers**  
St. Paul District

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**Phase I Report**

**MPCA Phase I Environmental Site Assessment**

**CONTAMINATED MATERIALS & GROUNDWATER INVESTIGATION**

**Chaska Flood Control Project  
Stages 3 and 4  
Chaska, Minnesota**

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**Phase I Contaminated Materials and Groundwater Investigation  
Chaska Flood Control Project  
Stages 3 & 4  
Chaska, MN**

**Purpose**

This Phase I investigation was conducted in accordance with the Minnesota Pollution Control Agency (MPCA) guidance from the *Property Transfer Technical Assistance Program*. This report will enable the MPCA to review and provide recommendations to the Corps of Engineers regarding a search of the available regulatory, historical, and geological sources of information. The findings, conclusions, and engineering considerations contained within this report will form the foundation for optimizing future field investigation strategies for determining, or verifying, the existence of environmental hazards.

This report summarizes the environmental investigation findings based on historical, geological, and regulatory agency records for Stages 3 and 4 of the Chaska Flood Control Project. This investigation was conducted in order to minimize the possibility that unexpected hazardous, toxic, or otherwise regulated materials and/or contaminants will be encountered during construction phases of the Chaska Flood Control Project. This study will enable the project designers to anticipate requirements for special handling of materials and groundwater during construction and to make alignment changes to minimize the need for special handling.

**Property Location**

The proposed flood control project is located in east central Minnesota, on the southern and eastern edges of the City of Chaska, in Carver County. Chaska is located approximately thirty miles southwest of St. Paul (See Figure 1).

**Project Description**

Stage 3 of the flood control project consists primarily of a diversion channel which will protect Chaska from flooding in East Creek during a 5,500 cfs flow event. This 6,000 foot long diversion channel is comprised of several segments. The diversion originates near Highway 17 and Engler Boulevard with a 3400 foot twin levee riprapped lined channel which merges into a 1,300 foot grass lined channel. The flood waters are then to be carried 1,000 feet to the Minnesota River through a concrete channel. The project also incorporates an inlet structure, two drop structures, 2000 feet of levee, four bridges, and a stilling basin (See Figures 2 through 12).

Stage 4 of the flood control project consists of 2,800 feet of new levee on the south and east side of Courthouse Lake, and raising 4,200 feet of existing levee on the south side of the City of Chaska. This stage of the project also includes an elaborate system of relief wells and interceptor pipes on the

landward side of the levee, as well as the use of wick drains and a staged construction of the levee to consolidate and strengthen the foundation soils under the new levee prism and under the fill sections required to raise the levee to its required top elevation (See Figures 13 through 29).

### Background

This contaminated materials and groundwater investigation was prompted for several site specific reasons. A large pile of beet processing residue (a lime pile) is located on the proposed alignment of the diversion channel for Stage 3 of the project near the downstream end of the channel. Empty fifty-five gallon drums have been found near the outlet for Stage 3 of the project. In addition, it is known that an unregulated burn/dump site operated in the Stage 4 reach of this project for many years. Several geotechnical borings advanced for the Stage 4 reach indicate the presence of dump fill materials and light non-aqueous phase liquids and odors in the area of the burn/dump site.

Since Stages 3 and 4 of this project require excavation, dewatering, and the use of wick drains in suspect areas, a more extensive Phase II subsurface investigation is anticipated.

Stage 3 is in the preliminary design phase. Final design is anticipated to be complete in December 1993, with construction beginning in March 1994.

Stage 4 is currently in the final design phase. The final draft design is anticipated to be complete in early September 1992. The final design is expected to be complete in early December 1992, with construction beginning in February 1993.

Involvement with the MPCA to date suggests that the Corps may be required to discharge groundwater associated with construction activities to the local wastewater treatment plant and provide soil venting and capping of the abandoned burn/dump site near Stage 4. The MPCA has made no special requests as of yet for Stage 3. The Corps does not anticipate any Hazardous Toxic or Radiologic Waste (HTRW) type environmental problems on Stage 3 at this time.

The St. Paul District is committed to proactive involvement with the MPCA throughout all phases of the Chaska Flood Control Project. By working closely with the MPCA the Corps, and the City of Chaska, will be able to receive protection under the Minnesota Land Recycling Act (MLRA) of 1992. The MLRA is a statutory law which protects voluntary parties from environmental liability such as becoming a responsible party to a HTRW release.

### Site Geology and Soils Characterization

#### General Topography

The portion of the City of Chaska, Minnesota, where the proposed flood control improvements would be located is within the Minnesota River Valley. The

valley trends northeast and is approximately 2.5 miles wide in this reach. The floodplain lies at an approximate elevation of 705, averages one mile in width, and is characterized by extensive marshy areas and lakes. Alluvial and bed-rock terraces rise above the floodplain and form regionally prominent benches at elevations of 750 and 800. Most of the developed portion of Chaska is situated between elevations of 710 and 730, at the upstream limit of a terrace that trends northeast along the base of the valley wall. The river valley walls rise sharply above the floodplain and terraces to form a bluff that grades into a hummocky, poorly-drained regional highland at an elevation of 850 on the north side of the valley, and at an elevation of 900 on the south side of the valley.

Chaska Creek emerges from the regional highland in a deep, steep-walled valley on the northwest side of Chaska and flows in a shallow channel around the western and southern edges of the city to the Minnesota River. East Creek emerges from a similar but smaller valley onto a large terrace about 1.5 miles northeast of Chaska. The creek flows southwesterly across the terrace, cuts through the northeast corner of Chaska, and joins the Minnesota River downstream of the city. Topographic features at the mouth of the East Creek ravine indicate the presence of an alluvial fan on the terrace and a previous flowage path of East Creek near the valley wall toward the northeast. The normal flow in the two creeks is sustained by groundwater discharging from pervious materials in thick deposits of glacial till that comprise the surrounding regional highlands.

### **General Geology**

The region surrounding the project area was glaciated extensively during the Pleistocene Epoch. Advancing and retreating glaciers laid down thick deposits of unsorted till and outwash sand that today form a hummocky, poorly-drained plain dotted with numerous marshes and small lakes. The glacial drift reaches a thickness of between 200 and 250 feet and lies unconformably on dolomitic lime-stone and sandstone of the Prairie du Chien and Jordan Formations. The large valley of the present Minnesota River was carved by the glacial River Warren, which carried large volumes of water discharging from the now-extinct glacial Lake Agassiz located in western Minnesota and eastern North Dakota. Glacial River Warren cut deeply into bedrock and formed the terraces that are prominent today. As the flows decreased, the valley was filled to its present level with alluvium. Recent borings and historic water-well records indicate alluvium approximately 180 feet in thickness. Bedrock elevation is between 530 and 542 (NGVD 1929 Adj.). The upper bedrock consists of weathered to slightly weathered fine grained, silty, glauconitic sandstone of the Franconia Formation. Sandstones of the Dresbach and Hinkley Formations underlie the Franconia.

### **Overburden Geology**

#### **Stage 3**

The substantial variability of alluvial deposits encountered by subsurface

investigations along the Stage 3 alignments do not permit a clear definition of precise boundaries between depositional time periods. However, evaluation of topographic features in combination with subsurface exploration data enabled the development of a general geologic profile across the terrace and floodplain between the valley wall and the Minnesota River in the area of the proposed diversion channel.

A general geologic profile along Stage 3 indicates glacial till in the valley wall, highly variable alluvial material within the terrace downstream from the mouth of the East Creek ravine, more uniform sand strata within the riverward portion of the terrace, and finer-grained and more variable alluvium within the floodplain of the Minnesota River. A significant amount of fill material is found on the surface near the downstream end of the Stage 3 alignment, including a lime pile deposited by the adjacent American Crystal Sugar Processing Plant.

#### Stage 4

Stage 4 of the Chaska Project has been divided into five reaches for the purpose of defining the overburden geology. Reach 3 extends from Station 21+00 to Station 34+00, the Stations which correspond to the area which has the most significant evidence of contaminated soils and groundwater which may affect the project.

As discussed in the DM for Stage 4, the overburden geology in Reach 3 is similar to the overburden geology in Reach 2, except that a large amount of uncontrolled fill has been placed northeast of the sewage treatment plant. The discussion of the soils for Reach 3 applies to the soils which are found below the dump fill materials (below approximately Elevation 701).

The foundation soils for the levee consist of highly plastic soft clays overlying much firmer organic silts and clays. The soft materials have a maximum thickness of about twenty-five feet. The levee alignment in this reach runs near Courthouse Lake, which is an old open pit clay mine which has been filled with water to make a suitable habitat for trout. The bottom of Courthouse Lake is below elevation 650. The lake bed has a steep slope in this area. Borings taken through the existing levee adjacent to the lake and the sewage treatment plant indicate considerable consolidation of the soft material.

#### **Site Hydrogeology**

The primary aquifers in the Chaska area consists of Pleistocene sand and gravel glacial deposits and bedrock aquifers of the Prairie du Chien dolomite and the underlying Jordan sandstone. Beneath these units are the St. Lawrence and Franconia Formations which are aquitards and generally poor water producers. The underlying Dresbach sandstone is a good aquifer. The configuration of the water table below the ground surface is expected to be a subdued replica of the ground surface. Regionally the groundwater moves toward the Minnesota River; however, complex flow patterns indicate shallow movement toward local surface drainage where discharge to streams and

evapotranspiration occurs. The uplands are recharge areas and the floodplain is a discharge area. Point source discharge (springs) along the Minnesota River Valley are common.

Local variations in precipitation and river stage are expected to be rapidly reflected in the water table in the upper soils near the Minnesota River. Stratified silts, clays and sands will yield some perched water tables. Borings in Stage 3 show artesian water in soils along the proposed channel. Channel excavations are, for the most part, above the groundwater levels in the upper reach of Stage 3. The downstream end of Stage 3 consists of marshy land with a thick mat of organic silts and clays that confine the groundwater. Excavations are well below the groundwater surface and dewatering will be a major effort. Excavations in Stage 4 are relatively shallow and the hydrogeologic conditions should result in routine construction activities.

### **History of Ownership and Operations**

#### **Introduction**

Given the large extent of the flood control project, several properties had to be investigated. Currently the City of Chaska owns the property for the project.

The Environmental Resources Branch conducted an environmental site history for Stages 3 and 4 of the Chaska, Minnesota, Flood Control Project. The purpose of this report is to identify businesses, industries and activities in the area of the proposed flood control project that could influence the location or construction of project features and to identify areas that may require additional testing to determine the presence of contaminated conditions.

This report is based on the review of existing information in the literature, maps, historical records, aerial photographs, city directories, and similar sources. A field survey of the area was also completed. Each of the sources is discussed separately. (Field data from the literature search are on file in the Environmental Resources Branch, Cultural Resources Section.)

#### **Background**

Personnel in the Corps of Engineers Environmental Branch examined all the available maps of the Chaska area, including county plat and Sanborn Insurance maps.

Most of the plat maps are too general in nature to provide useful information about potential contaminated sites in the project area. The 1927 plat map, while detailed, does not include land within the Stage 3 project area.

The historic maps indicate that the only industry that has operated in the project area is the Crystal Sugar Factory. No dumps, landfills, or other types of waste areas, or commercial/industrial activities were indicated on the historic maps. (Copies of the available historic plat maps for the project

area are included in Appendix E).

Sanborn Insurance maps for the period between 1881 and 1924 are available at the Minnesota Historical Society. Prior to 1911, the Sanborn maps for Chaska did not extend more than 1/4 block south of First Street (toward the levee). The structures that were located south of First Street (between Spruce and Beech Avenues) were all private dwellings. Beginning in 1911, the Sanborn Maps extend farther towards the levee, but show mostly vacant lots and some private dwellings between First Street and the levee. By 1924, most of the vacant lots had been filled by private homes. The Sanborn Maps show that along the entire reach of the levee between Spruce and Beech Avenues, there was no commercial or manufacturing activities during the period between 1881 and 1924. An overview from the 1924 Sanborn map shows the location of the sugar factory in relation to the City of Chaska. A detail drawing from the 1910 Sanborn map shows the layout of the sugar factory. Copies of the 1910, 1911, and 1924 Sanborn Maps are included in Appendix C.

It should be noted that the Sanborn Maps did not extend beyond Spruce or Beech Avenues for any of the available years. (Copies of the Sanborn Maps are on file in the Cultural Resources Section, Environmental Resources Branch).

Sources available at the Minnesota Historical Society Library, including histories of Chaska and of Carver County, contained no information to indicate the potential for any hazardous/toxic sites with the reaches of Stage 4. The University of Minnesota, the Carver County Historical Society, and the Chaska Historical Society did not yield any additional information on this issue.

#### **Property Features**

A 1992 field survey and information from the City of Chaska indicated the existence of a former burn/dump site near the sewage treatment plant, located next to the railroad tracks near the river. Information provided to the team suggested that the dump had been in use since the early 1900's. However, an enlargement of a 1937 aerial photograph that was procured from the National Archives does not indicate any dump site or landfill existed in the area between Courthouse Lake and the Minnesota River. In addition, the 1937 photograph does not show any commercial or industrial development within the residential limits of the City of Chaska, along the reach of the Stage 4 levee.

The 1937 aerial photograph also shows a berm like configuration between the Crystal Sugar Plant and the Minnesota River that appears in later photographs as well. This is now the location of a lime settling pond. The 1937 photograph indicates that this berm was at least partially filled with water at that time. (See the Field Reconnaissance section for a current description of this berm/pond).

Aerial photographs from 1951, 1965, and 1974 are available in the Corps map library. A photocopy of a 1970 aerial photograph was also obtained from the Minnesota Historical Society library. The 1951 photograph was studied for indication of a dump/burn site, but none was evident. However, a small area



of fill is evident adjacent to the railroad tracks. The 1965 aerial shows a small cleared area at the end of a road near the sewage treatment plant that could possibly be a dump. The courthouse facilities are evident on the west side of Courthouse Lake. It appears that this area was filled with random fill and then graded.

The 1974 aerial indicates that this same cleared area was expanded to the east. Thus, the aerial photographs indicate that the dump was used beginning at some point in the late 1940's, rather than the early 1900's. In addition, the dump area appears to be more limited in extent than was previously suspected.

The 1951 photograph shows a small residential development west of the Crystal Sugar Plant, but no industrial or commercial development. The 1965 photograph shows more extensive residential development and commercial buildings across Highway 212 from the sugar plant, but the development does not extend very far north along the proposed Stage 3 diversion channel.

The 1970 and 1974 photographs indicate that more residential development has occurred along Highway 17 north of Highway 212, although it is not continuous. The only apparent industrial/manufacturing enterprise in the 1970's photographs is the Gedney Pickle Plant, located east of the Crystal Sugar Plant along Highway 212. The pickle factory is outside the area of the proposed diversion channel. (Photocopies of the 1951, 1965, and 1970 aerials are included in Appendix D; the remaining aerials were too large to photocopy).

Other than information about the Crystal Sugar Factory, local histories included no information about other businesses or industries in the Stage 3 project area. Business and city directories were not available for Stage 3. The City of Chaska provided maps showing current land use within the project area, but has not provided any additional information about past land use.

The Chaska Crystal Sugar Plant was built in 1906 and stopped producing granulated sugar in 1971. Information about the sugar beet manufacturing process that was conducted at the Chaska plant is included in the Appendix. The photograph did not show any additional commercial or industrial development along the proposed diversion channel in Stage 3.

The American Crystal Sugar Company has confirmed that the berm/pond identified in the aerial photographs was a lime pond used to discharge waste lime used in the processing of sugar beets. The processing of sugar beets was discontinued in 1971 and the factory has been used as a distribution center since that time. The American Crystal Sugar Company sold the lime pond site in 1978. The current owners are periodically mining the lime residue from the pond and selling it for soil amendment. (See Appendix E for copy of letter from the company).

#### **Site Visit Findings**

On May 11, 1992, members of the Chaska Environmental Site Assessment team

conducted a field tour via automobile and foot of Stage 3 of the Chaska Flood Control Project.

Three businesses along Highway 17 near the intersection with Highway 121 were noted as sitting adjacent to the proposed diversion channel in Stage 3. These were Penrith Akers, a juice manufacturing company; Hydraulic Component, Inc. and AdTech, Inc. (1605 Audobon Road). None of these appeared to pose any hazardous-toxic or contaminated waste concerns for the project.

The Crystal Sugar Factory organic waste pond, which lies between the factory and the Minnesota River within the reach of the proposed diversion channel, was noted as a potential problem area. In the aerial photographs described above, this site appears as a berm. Apparently organic waste from the sugar processing operations was placed in this pond until it became filled. Currently the pond/berm is filled to an elevation of about 15 to 20 feet above the Minnesota River. Private owners have purchased the fill site and have mined it for agricultural lime (See Figure 2 and the aerial photographs in Appendix D for the location of the berm).

Approximately 50 feet downstream from the former settling pond, a large number of 55 gallon barrels are evident buried in the top of the embankment, which is primarily sand. The exposed barrels appear to have been empty when disposed, as both ends of the barrels were cut out. It does not appear that these barrels pose a contaminant problem. However, if the final design would result in construction activities in this area, chemical analysis of the soils for contaminants is recommended.

On May 11, 1992, the St. Paul District's Environmental Site Assessment Team for the Chaska Project also conducted a field reconnaissance of Stage 4 of the project. The field reconnaissance aided in delineating the extent of an abandoned city burn/dump site between Courthouse Lake and the Minnesota River (See Figure 13). This field survey raised concerns about potential groundwater contamination near the sewage treatment plant, which is situated between the Carver County Courthouse and the Minnesota River.

#### Analysis of Soil Borings For Contaminated Materials

##### **Stage 3**

The subsurface investigations for Stage 3 indicate no evidence of contaminated soils and groundwater for this Stage. One soil boring, 90-174M, located at Station 8+10, 17 feet left of centerline when looking downstream (See Figure 3), indicates the top 4.8 feet (Elevation 719.2 to Elevation 714.4) of the boring is fill. The geologist logging the boring noted 20 percent of the material to be rubble consisting of metal, concrete, and wood. From 4.8 feet to 5.5 feet (Elevation 714.4 to 713.7), the geologist noted large rocks, plastic, and a concrete slab. This material is most likely not contaminated, but represents a large amount of material which will have to be moved or disposed of in an atypical manner. Soil boring logs discussed in this report are included in Appendix B.



Borings 92-172M and 92-173M were advanced through a beet processing residue (lime pile) at Stations 2+20 and 5+60, respectively. Boring 92-172M indicates the residue occurs from the ground surface to a depth of 26.9 feet (Elevation 725.3 to Elevation 698.4). Boring 92-173M indicates the residue occurs from the ground surface to a depth of 19.9 feet (Elevation 727.5 to Elevation 707.6). The residue is logged as a silty clay which is very soft, of medium plasticity, wet to saturated, white to gray in color, containing some organics in layers (1 percent sticks and roots), and having a strong reaction to acid (a calcareous substance). The Unified Soil Classification System (USCS) classification for this soil is MH. This material is most likely not contaminated, but represents a large amount of material which will have to be moved or disposed of in an atypical manner.

While determining the water level in boring 92-173M, the geologist noted that the water in the hole was bubbling vigorously. The hole had been cleaned out to a depth of 20 feet (Elevation 707.5), the hollow stem auger was set at 25 feet (Elevation 702.5), and split spoon sampling was completed to a depth of 30 feet (Elevation 697.5) at this time. The bubbling was determined to be caused by a gas source. A sample of the gas was collected in a bag, tested for flammability, and determined to be methane.

#### Stage 4

##### Soil Borings Advanced By The Corps of Engineers

This discussion of the soil borings on Stage 4 will proceed upstation along the levee. Distances to the right and to the left of the centerline of the levee are oriented looking downstation.

Eight borings have been advanced in the immediate area of the existing dump, extending from approximately Station 21+50 to Station 35+75. All of the borings have been advanced on the left side of the centerline of the levee. The locations of these borings can be found on Figures 16 and 17.

##### Boring 73-2M

Boring 73-2M is located approximately 110 feet left of centerline at Station 21+50. This boring has a ground surface elevation of 701.5 NGVD. Current cross sections indicate the swamp has an approximate elevation of 701.5. The current ground surface elevation at this location is approximately 724 NGVD. The groundwater surface elevation in this boring was at the ground surface. Based on this information, Boring 73-2M was most likely advanced prior to dumping activities at the site in the area of this boring. There are no indications of contaminated soils or groundwater in this boring.

##### Boring 82-51M

Boring 81-51M is located approximately 90 feet left of centerline at Station 23+80. This boring has a ground surface elevation of 718.75. Current cross

sections indicate the current ground surface elevation is approximately 720 or 721 NGVD, indicating some filling activities have continued since 1982. The groundwater surface elevation in this boring is 700.

The field log for this boring indicates that the top five feet (Elevation 718.75 to Elevation 713.75) of the boring is a silty, sandy gravel dump fill. Pieces of wood, paper, cloth, glass, and plastic are scattered from a depth of five feet (Elevation 713.75) to a depth of 16 feet (Elevation 702.75). The soils at a depth of 20 feet (Elevation 698.75) were noted as being an oily, gravelly, silt with a fuel oil smell. The geologist also classified the materials as trash. There are no other indications of contaminated soils or groundwater in this boring.

#### Boring 89-111M

Boring 89-111M is located approximately 125 feet left of centerline at Station 26+50. This boring has a ground surface elevation of 722. Current cross sections indicate the current ground surface elevation is approximately 722, indicating filling activities have discontinued since 1989. The groundwater surface elevation in this boring is 701.5.

The field log for this boring indicates traces of wood from the ground surface to a depth of four feet (Elevation 722 to Elevation 718). The soils from a depth of four feet to a depth of 10 feet (Elevation 718 to Elevation 712) are classified as a gravelly, rubbly, silty sand. Approximately 15 percent of the materials are concrete rubble and chunks of wood. The soils from 10 feet to 16 feet (Elevation 712 to Elevation 706) are classified as a gravelly, rubbly, silty sand with 15 percent of the materials consisting of broken glass, concrete, pieces of wood, and copper wire. From a depth of 16 feet to 20 feet (Elevation 706 to Elevation 702), the soils are classified as a gravelly, silty sand with traces of broken glass and wood. The soils have an oily odor and are sticky in places between these elevations. An oily odor is again noted in the gravelly, silty sand between 20 and 23 feet (Elevation 702 to Elevation 699), but there are no indications of rubble. The rubbly, silty sand is found again between depths of 23 feet to 29.5 feet (Elevation 699 to Elevation 693), with approximately 10 percent of the materials being broken glass and wood. The soils between these elevations are also oily, but an oily odor was not present. There are no other indications of contaminated soils or groundwater in this boring. However, a pilot boring advanced immediately adjacent to Boring 89-111M to obtain undisturbed soil samples indicated rubble and landfill materials from 11 to 13 feet (Elevation 711 to 709) and rubble and landfill materials with a solvent odor from 23.5 to 25.5 feet (Elevation 698.7 to Elevation 696.7).

#### Boring 89-126M

Boring 89-126M is located approximately 30 feet left of centerline at Station 26+50. This boring has a ground surface elevation of 707. Current cross sections indicate the current ground surface elevation is approximately 707, indicating filling activities have discontinued since 1989. The groundwater

surface elevation in this boring is 701.2.

The top two feet of this boring (Elevation 707 to Elevation 705) is a rubbly, clayey, silty sand, with approximately 15 percent of the materials classified as a rubble consisting of broken glass and pieces of wood. The soils appear to be clean until a depth of five feet (Elevation 702). At this elevation, the soils are a rubbly, silty, clayey sand, with 10 percent of the material classified as rubble consisting of broken glass and pieces of deformed iron. Twenty percent of this material is logged by the geologist as a white, gooey-clayey material, possibly a non-soil material. There are no other indications of contaminated soils or groundwater in this boring.

#### Boring 80-25M

Boring 80-25M is located approximately 40 feet left of centerline at Station 29+00. This boring has a ground surface elevation of 726.6. Current cross sections indicate the current ground surface elevation is approximately 726. The groundwater surface elevation in this boring is 701.6. This boring appears to have been advanced through the emergency levee, which was either constructed prior to the initiation of dumping activities or the emergency levee prism was cleared of dump fill materials prior to the construction of the levee. The former scenario is most likely correct. There are no indications of contaminated soils or groundwater in this boring.

#### Boring 89-110M

Boring 89-110M is located approximately 60 feet left of centerline at Station 29+60. This boring has a ground surface elevation of 726.6. The groundwater surface elevation in this boring is 687.

A slight solvent odor was noted at a depth of 26 to 28 feet (Elevation 700.6 to Elevation 698.6) in a gravelly, sandy silt. A faint solvent odor was also noted at a depth of approximately 30 feet (Elevation 696.6). There are no other indications of contaminated soils or groundwater in this boring.

#### Boring 89-106M

Boring 89-106M is located approximately 30 feet left of centerline at Station 31+60. This boring has a ground surface elevation of 725.5. The groundwater surface elevation in this boring is 698.6.

This boring indicates occasional broken glass and concrete chunks between the ground surface and a depth of 7.5 feet (Elevation 725.5 to Elevation 718). The soils from a depth of 13 feet to a depth of 21 feet (Elevation 712 to Elevation 704.5) is a rubbly, gravelly sand with 10 percent of the materials classified as rubble consisting of broken glass, concrete, and asphalt. There are no other indications of contaminated soils or groundwater in this boring. However, a pilot boring advanced immediately adjacent to Boring 89-106M to obtain undisturbed soil samples indicated rough drilling action from

approximately 12 feet to 15 feet (Elevation 713.5 to Elevation 710.5) and from 17 feet to 18 feet (Elevation 708.5 to Elevation 707.5). The drillers could not advance the piston sampler below Elevation 710.5.

#### Boring 79-12M

Boring 79-12M is located approximately 60 feet left of centerline at Station 35+75. This boring has a ground surface elevation of 711.2. The groundwater surface elevation in this boring is 707.7.

The top five feet of this boring (Elevation 711 to 706) consists of a cinders and sand fill. From five to eight feet, the soils consist of a fill containing 60 percent sand and 40 percent trash, concrete, gravel, and traces of clay. There are no other indications of contaminated soils or groundwater in this boring.

#### Soil Borings Advanced by Others

##### Wastewater Treatment Plant

Soil borings were advanced in the area occupied by the City of Chaska Wastewater Treatment Plant for the purpose of designing foundations for several upgrades to the facility. The soil borings were advanced by Braun Intertec (formerly Braun Engineering) in 1974, 1978, and 1985. The majority of these soil borings note dump fill materials from the existing ground surface to approximately Elevation 700. This is consistent with the borings advanced by the COE. The locations of the borings can be found on Figure 30. Borings ST-1, ST-2, ST-6, ST-8, ST-10, and ST-11 noted evidence of typical dump fill materials. The remaining borings advanced by Braun do not note any indications of concrete rubble or other typical dump materials on the field log.

Boring ST-1. The top 13 feet of this boring (Elevation 712 to Elevation 699) is fill. The following two feet (Elevation 699 to Elevation 697) of fill contains glass, tins, branches and is classified as soft topsoil and debris. There are no other indications of contaminated soils or groundwater in this boring.

Boring ST-2. The top six feet of this boring (Elevation 713 to Elevation 707) is fill. The following five feet (Elevation 707 to Elevation 702) of fill has traces of bricks. The following 2 feet (Elevation 702 to Elevation 700) of fill has traces of wood. There are no other indications of contaminated soils or groundwater in this boring.

Boring ST-6. The top seven feet (Elevation 716 to Elevation 709) of this boring is fill. The following five feet (Elevation 709 to Elevation 704) of fill contains glass, wood and other debris. The following five feet (Elevation 704 to Elevation 699) of fill contains glass and wood debris. There are no other indications of contaminated soils or groundwater in this boring.

Boring ST-8. The top four feet (Elevation 714 to Elevation 710) of this boring is fill. The following ten feet (Elevation 710 to Elevation 700) of fill contains some wood. There are no other indications of contaminated soils or groundwater in this boring.

Boring ST-10. This boring is fill with wood and glass from the existing ground surface (Elevation 715) to the original ground surface (Elevation 697). There are no other indications of contaminated soils or groundwater in this boring.

Boring ST-11. The top 14 feet (Elevation 726 to Elevation 712) is dump fill with traces of wood. A layer of wood was noted at a depth of 18 feet (Elevation 708). The materials from 18 to 26 feet (Elevation 708 to 700) are fill. There are no other indications of contaminated soils or groundwater in this boring.

#### Proposed Carver County Government Center

Soil borings were advanced in the area of the proposed Carver County Government Center in June 1989 by Twin City Testing Corporation for the purpose of designing foundations to support the proposed structures. The locations of these borings are indicated in Figure 31.

Borings B-12, B-13, B-15, B-17, B-27, and B-30 indicate a significant amount of debris fill from the ground surface to approximately Elevation 700 (or the approximate elevation of the natural soils at the location of the boring), including wood, metal, glass, cinders, and ashes. These five borings are located adjacent to the wastewater treatment plant, where soil borings also indicate debris fill. Borings B-15 and B-27 also include metal and wood. It appears likely that the fill at these two borings is associated with the backfill for a sanitary sewer on the site. The remainder of the borings towards the North (away from the flood control project and away from the treatment plant) consist of a mineral soil fill with traces of brick. The source of the bricks in this area may be a brick factory which previously existed at or near the site or demolition debris. Borings B-2, B-4, B-10, B-28, B-29, and B-34 note indications of brick. Other borings containing suspect materials are discussed below.

Boring B-12. The top 24 feet of this boring (Elevation 724 to Elevation 700) is fill containing concrete, brick, wood, metal, glass, and cobbles. There are no other indications of contaminated soils or groundwater in this boring.

Boring B-13. The top 23 feet of this boring (Elevation 722 to Elevation 699) is fill containing concrete, metal, brick, glass, and wood. There are no other indications of contaminated soils or groundwater in this boring.

Boring B-15. The top 9 feet of this boring (Elevation 721 to Elevation 712) is fill containing brick and metal. There are no other indications of contaminated soils or groundwater in this boring.

Boring B-17. The top 9 feet of this boring (Elevation 722 to Elevation 713) is fill containing brick and metal. The next 9 feet of this boring (Elevation 713 to Elevation 704) is fill containing brick, wood, and cinders. There are no other indications of contaminated soils or groundwater in this boring.

Boring B-27. The top 21 feet of this boring (Elevation 721 to Elevation 700) is fill containing brick, metal, and wood. A sanitary sewer was encountered at Elevation 700. There are no other indications of contaminated soils or groundwater in this boring.

Boring B-30. From a depth of 7 feet to a depth of 9.5 feet (Elevation 719 to Elevation 716.5), this boring indicates fill containing ashes. From a depth of 9.5 feet to 12 feet (Elevation 715.5 to Elevation 714), the boring is mostly ashes. Some glass is noted between a depth of 12 feet and a depth of 16 feet (Elevation 714 to Elevation 710). There are no other indications of contaminated soils or groundwater in this boring.

#### Methane Gas

Explosiometer readings were recorded in borings B-11, B-12, B-13, B-15, B-17, B-25, and B-27. Readings greater than 0 percent of the lower explosive limit (LEL) were recorded in borings B-12, B-13, and B-17, which are the three borings closest to the wastewater treatment plant and the dump/burn site. Boring B-12 had a reading of 60 percent of the LEL at a depth of 10 feet (Elevation 714) and a reading of 50 percent of the LEL at a depth of 15 feet (Elevation 709). Boring B-13 had a reading of 50 percent of the LEL at a depth of 15 feet (Elevation 707). Two air samples were obtained for laboratory testing. A sample obtained at a depth of 5 feet (Elevation 719) in boring B-12 indicated a methane concentration of 32,000 parts per million (ppm). A sample obtained at a depth of 15 feet (Elevation 708) in boring B-17 indicated a methane concentration of 190 ppm.

#### Site Stratigraphy

##### **Stage 3**

##### Profiles

A profile was not developed for Stage 3. The lime pile is not considered to be an environmental concern at this time.

##### Cross Sections

Cross sections were not developed for Stage 3. The lime pile is not considered to be an environmental concern at this time.

##### **Stage 4**

##### Profiles

A profile, Figures 32 through 34, has been developed for Stage 4 to illustrate the site stratigraphy along the proposed levee. The profile section line is found in Figures 16 and 17. The stationing along the profile is the stationing along the adjacent levee control line. The profile was selected to cut through the soil borings which would most influence the levee construction. The stratigraphy of the dump fill materials, the elevations of the groundwater table, and the pre-dump original ground surface elevations are readily apparent on this profile. A discussion of this profile follows.

Debris fill exists from the existing ground surface to the pre-dump ground elevation from approximately Station 20+80 to approximately Station 28+00. At this point, the debris fill materials were placed on top of the riverward slope of the emergency levee. The slope was filled to the existing top elevation of the emergency levee.

The existing ground surface at boring 89-126M is shown to be lower than the remaining borings. This boring was advanced at the riverward toe of the debris fill slope and was included on the profile to show the riverward extent of the debris fill adjacent to the proposed levee section and to further verify the elevation of the pre-dump original ground surface. Boring 89-111M was advanced at approximately the same station as boring 89-126M, but further landward. Boring 89-111M indicates debris fill materials from the existing ground surface to approximately Elevation 699 and oily odors and sticky soils at the groundwater table.

Boring 80-25M was advanced through the emergency levee. This boring had no indications of contaminated materials or groundwater. Based on this finding, the emergency levee was either placed on the original pre-dump ground surface prior to dumping in this area or the foundation for the levee was cleared of all unsatisfactory materials prior to constructing the emergency levee. The former scenario is most likely correct.

Boring 89-110M was advanced through the existing levee on the landward side of the top of the levee. No indications of debris fill materials were noted in this boring, indicating dumping activities did not occur until after this portion of the levee was constructed; however, slight and faint solvent odors were noted at the approximate interface of the levee prism and the original ground surface and approximately 3 feet above the base of the levee. The source of the solvent odor is not known, but the elevations of the odors are at the elevation of the groundwater table and within a zone of the levee which experiences frequent fluctuations in the elevation of the groundwater table.

Boring 89-106M was also advanced through the existing levee on the landward side of the top of the levee. This boring does indicate evidence of debris fill materials. This levee is likely the embankment which supported the abandoned Chicago, Milwaukee, St. Paul, and Pacific Railroad. The embankment was likely incorporated into the Chaska levee system because of its location and apparent engineered design by the railroad. It is not clear how the debris fill materials became incorporated into this embankment. One possible scenario is that dumping occurred off of the railroad embankment during the time period between the abandonment of the railroad and the 1953 construction of the levee. The debris fill dumped on the landward side of the levee could



then have been covered with soil when the railroad embankment was raised to become part of the 1953 levee system and during post-1953 emergency raises of the levee system during flooding. This scenario is verified by the evidence of debris fill materials under the existing wastewater treatment plant, which was constructed in \*\*\*\*.

A further verification of this scenario exists. Records of the original levee were located in the Corps of Engineers Chaska Flood Control Project Geotechnical Engineering files. The original levee was constructed in the winter of 1952, with completion by the spring of 1953. Construction records indicate that during grubbing operations for the levee, an abandoned dump was encountered between the abandoned railroad line and the Maple Street pumping station (approximately Station 34+00 to Station 40+00). Funds were not available to excavate the dump site; therefore the riverward side slopes were flattened to a 1V on 4H slope to account for potential instabilities due to a poor foundation for the levee.

Boring 79-12M was advanced at the toe of the slope on the landward side of the levee. The top eight feet of this boring is cinders and debris fill. Since this boring is located outside of the levee prism and lies within the reach described as an abandoned dump during the 1953 construction of the levee, the ground surface in this area is probably the maximum elevation of dumping between the abandon railroad and the Maple Street pumping station prior to the construction of the levee in 1953.

#### Cross Sections

The logs of borings advanced by the Corps of Engineers indicating evidence of contaminated soils and/or groundwater have been drawn on the appropriate cross sections, Figures 35 through 40. These sections illustrate the typical proposed levee being constructed directly on the dump fill materials. The elevations of the groundwater table, the original pre-dump ground surface, and the various odors noted on the field logs are readily apparent on these sections.

The cross sections included in this report are typical cross sections taken from the Chaska Stage 4 Plans and Specifications drawings developed to date. Typical sections, as the name implies, cover a reach of a project having similar construction features. The actual cross section which is drawn is from a specific station included in the project reach covered by the typical section. The boring logs which are included on the typical sections may not agree with the cross section regarding ground surface elevations, etc., because the boring was most likely not advanced at the same station for which the section was drawn. To minimize interpretational discrepancies by readers of this report, the debris fill and levee fill units shown on the profile are not sketched on the cross sections. The sections are included to illustrate the construction of the levee and other project features adjacent to the contaminated areas.

In general, the cross sections indicate debris fill adjacent to the proposed levee from the existing ground surface to approximately Elevation 700 from Station 21+00 to Station 28+00 and adjacent to and below the proposed levee



raise from Station 30+00 to Station 37+00. The presence of debris fill is also illustrated more clearly where the inspection/cutoff trench, relief wells, and storm sewers are to be constructed.

The cross sections also more clearly illustrate the potential groundwater contamination at the elevation of the groundwater table in the areas where wick drains are to be installed.

#### Summary

Debris fill is present along the landward side of the existing and proposed levees. From approximately Station 20+80 to Station 28+00, adjacent to the proposed new levee, the new levee will be constructed on top of the debris fill. Debris fill is not expected to be encountered between approximately Station 28+00 and Station 30+00. From approximately Station 30+00 to Station 37+00, the debris fill has been covered with soil during emergency raises of the levee to prevent flooding.

Groundwater contamination is suspected at and slightly above the elevation of the groundwater table from approximately Station 23+00 to approximately Station 30+00, as evidenced by solvent odors, petroleum odors, and petroleum contaminated soils noted in soil borings 82-51M, 89-126M, 89-111M, and 89-110M.

#### Regulatory Database Search

##### **Database List**

United States Environmental Pollution Agency (USEPA) and Minnesota Pollution Control Agency (MPCA) database records have been reviewed to identify potential environmental liabilities at, and near, Stages 3 and 4 of the Chaska Flood Control Project. The following databases were reviewed for the purposes of this study:

##### U.S. Environmental Protection Agency Databases

1. National Priorities List (NPL)
2. Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS)
3. Emergency Response Notification System (ERNS)

##### Minnesota Pollution Control Agency Database

1. Permanent List of Priorities (PLP)
2. Regulatory Compliance, Hazardous Waste Enforcement Log
3. List of Permitted Solid Waste Facilities
4. Hazardous Waste Permit Unit Project Identification List
5. 1980 Metropolitan Area Waste Disposal Site Inventory
6. 1980 Statewide Open Dump Inventory
7. Property Transfer Technical Review Data Base
8. Underground Storage Tank Information System

### **Summary of Database Search**

According to the MPCA Property Research Specialist, there are no sites listed in the above databases for the project property. However, several sites on the 1980 Metropolitan area Waste Disposal Site Inventory were found within one mile of the project property. The sites which are located near the Corps project are shown on Figure 1 in Appendix A.

1. Carver Dump (near the City of Carver)
2. Carver Highway Department Dump (between Edgehill Dr. and County Rd. 140)
3. American Crystal Sugar Abandoned Surface Impoundment Site (Lime settling pond, southeast of the Bierling Avenue and Bold Street intersection, 1070 Stoughton Avenue)
4. Gedneys Pickle Factory Surface Impoundment Site (between Highway 212 and 6th Street, approx. 11800 block)
5. Chaska Dump Site (between Willow Street and Beech Street, on the north side of the railroad tracks)
6. Underground Storage Tank Leaks and Spills (see Appendix F)

### **Engineering Considerations**

#### **Stage 3**

The fill materials located between approximately Stations 2+00 and 9+00 may require disposal at sites other than a typical flood control project disposal site. The rubble materials such as plastic, metal, large pieces of concrete, and concrete slabs will require disposal at a demolition landfill permitted to accept these types of materials. The lime materials may be acceptable to dispose of as an unsatisfactory material (as defined in a typical Corps of Engineers specification), but this should be cleared with the MPCA to determine whether or not such disposal will be permitted. It is possible that the material could be stockpiled and sold for soil amendment. The use of this material will probably not be permitted on the project.

The natural materials below the lime materials are apparently decomposing. Soil borings encountered a gaseous substance venting from the borehole. The occurrence of the gas and the nature of the underlying organic soils suggests the gas is methane. This is a natural process which is not attributable to any man-made materials. Other borings in the area did not indicate venting of gas, but the use of drilling fluids may have masked the presence of the gas. The construction contractor will be made aware of the occurrence of the methane gas and its location so that the proper precautions are taken during construction in this area, but the methane gas is not expected to cause any problems during the construction of Stage 3.

#### Stage 4

##### Contaminated Materials

A definite contaminated materials area exists at the dump site, from approximately Station 20+80 to Station 28+00. Contaminated materials also exist under the existing levee from approximately Station 30+00 to Station 37+00. The raising of the levee in these areas will require the placement of new impervious fill against the exposed dump materials. Excavation and other work related to the construction of the flood control project in these areas, such as for stripping, construction of relief wells and storm sewer system pipes and manholes, installation of a wick drain system, and for a required inspection/cutoff trench, will most likely encounter materials requiring special handling, not necessarily from a contamination standpoint, but from a materials disposal standpoint, due to the nature of the materials. The installation of the wick drains and relief wells, discussed below, may encounter materials which will prohibit the advancement of the wick materials.

The MPCA has indicated that it may allow capping and venting of the dump in the areas we are constructing the levee. The proposed levee construction will use impervious fill, which should satisfy capping requirements. Venting requirements should be straightforward, but not necessarily inexpensive. The areas to the landward side of the levee which are designed to carry surface drainage will also require capping to prevent infiltration into the dump fill materials.

##### Groundwater

Groundwater contamination is suspected from approximately Station 23 to approximately Station 30+00.

A wick drain system is being used to strengthen the soils underlying the new portions of the levee due to the levee raise. The wick drains are used to promote rapid drainage of the foundation soils to accelerate the consolidation of the soft soils. The accelerated consolidation of the foundation soils will allow the entire levee to be constructed in a two year timeframe.

The wick drains are long pieces of a geosynthetic drainage medium which are driven into the ground on a given spacing. The material acts as a wick, draining the groundwater from the soil pores. The wicks drain vertically up into a sand layer containing horizontal strip drains, which is designed to drain to a specific discharge location, in this case the river side of the levee. Since evidence of petroleum products and solvents has been found in areas where the wick drains are to be used, the wick drain system may be required to drain to a specific location to allow for testing of the water prior to discharging the water to the river. Testing of the groundwater in these areas is required to verify areas of groundwater contamination.

A series of relief wells and an inspection/cutoff trench will be installed on the landward side of the levee starting at approximately Station 34+00. The relief wells are required to limit seepage uplift pressures at the toe of the

levee to acceptable values. Installation of relief wells RW 35 and RW 36 will require drilling in an area which contains possible suspect materials. The cutoff/inspection trench will serve as an inspection trench during construction of the levee raise and will serve to lower the seepage gradient through the levee upon completion of the levee raise. The soils in the areas of the relief wells and wick drain systems should be tested to verify the nature of the existing fill materials in this area.

### Conclusions

#### **Stage 3**

The available evidence shows that, with the exception of the Crystal Sugar Factory, there has been little commercial or industrial development in the area of Stage 3 of the project. Moreover, the few commercial buildings that exist along the proposed diversion channel (along Highway 17) do not present any potential for contamination.

As a result of this study, one site has been identified as having minor potential for contamination in Stage 3 of the Chaska Flood Control Project. This site is located about 50 feet downstream from the settling pond/berm, but this site is not within the current proposed channel alignment.

Based on the available information, it appears that the settling pond or berm associated with the former operations of the Crystal Sugar Plant does not present a potential for contaminants or hazardous-toxic wastes, as the material used to fill the pond consisted of organic wastes from sugar processing operations. The lime material may pose a potential materials disposal problem for the Corps of Engineers. Methane gas will most likely be encountered during excavation in the vicinity of the lime pile at the downstream end of the diversion channel.

#### **Stage 4**

The available historical evidence shows that the portion of Chaska along the levee between Spruce and Beech Streets in the City of Chaska has never been developed for other than residential use. No businesses, neither retail nor manufacturing, were located along the levee between these streets (within at least one city block) since Chaska was settled in the 1850's. Therefore, it is highly unlikely that any hazardous/toxic sites exist within this portion of Stage 4 of the Chaska Flood Control Project.

The existing historic literature does not provide any information about the reach of Stage 4 in the area of Courthouse Lake. Information about this area was obtained via field reconnaissance and information from the City of Chaska, Corps of Engineers Geotechnical Engineering files, and others.

Soil borings advanced to complete the geotechnical design for Stage 4 indicate dump fill materials from approximately Station 21+00 to Station 37+00. Petroleum products and solvent odors were also evident in the borings in this

area. Soil borings advanced for the design of expansions to the wastewater treatment plant and the proposed Carver County Government Center also indicate dump or debris fill materials, as well as evidence of methane gas. Although the solutions to these potential contamination problems are straightforward, such solutions are atypical of work associated with a Corps of Engineers Flood Control Project.

#### Summary

As a result of this Phase I Contaminated Materials and Groundwater Investigation, only one site on Stages 3 and 4 of the Chaska Flood Control Project, the former burn/dump site, located between Courthouse Lake and the Minnesota River, has been identified as having a potential for encountering contaminated materials and/or groundwater during construction.

#### Recommendations

##### **Stage 3**

If the final alignment for the outlet channel is shifted downstream on the Minnesota River, testing the area for contaminants is recommended. At this time, however, additional investigations for Stage 3 are required only to identify the quantity of lime materials to be disposed of, to verify that the beet processing residue does not pose an environmental concern, and to verify that the gas encountered in soil boring 92-173M is methane. This information could be obtained during the subsurface investigation to be completed as part of the final design of Stage 3. As such, a Phase II Investigation is not recommended for Stage 3 at this time.

##### **Stage 4**

A Phase II Investigation is recommended for Stage 4. The Phase II Investigation should include sampling of the groundwater along the new levee alignment and along the levee raise alignment where wick drains and relief wells are to be used, in those areas where the potential for encountering groundwater contamination exists. In addition, test pits, hand auger borings, and/or shallow soil borings should be used to verify the nature of the materials to be encountered during excavation of the inspection/cutoff trench and installation of the relief wells, manholes, and storm sewers in the areas suspected to contain contaminated materials.

The Phase II Investigation should extend from approximately Station 12+00, where a surface sheen was noted during the May 11, 1992 field reconnaissance trip, to approximately Station 37+00. Soil boring 79-12M, located at Station 35+75, indicated potentially contaminated materials. Soil boring 89-122M, located at Station 36+80 did not indicate any potentially contaminated materials. Since boring 79-12M contains suspect materials and boring 89-122M does not, the Phase II work should be carried to at least Station 37+00 to cover the area between the last suspect boring and the first clean boring.

The test pits, hand auger borings, or shallow soil borings should follow the alignment of the inspection/cutoff trench and be located at the locations of the relief wells, manholes, and storm sewers in the suspect areas.

A Phase II Investigation Work Plan delineating this work will be prepared and submitted to the MPCA for approval.

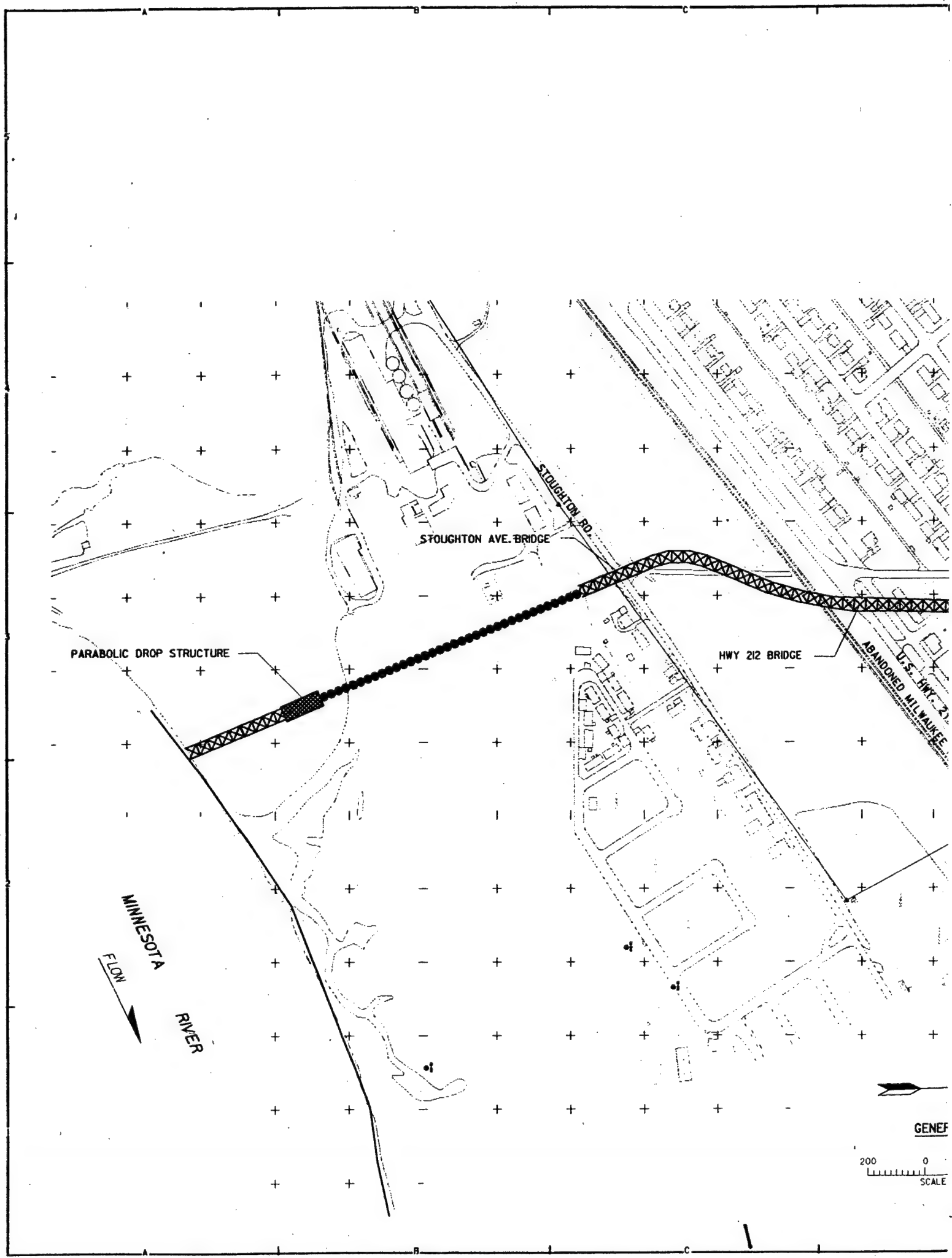
#### Information Sources

All available sources at the Minnesota Historical Society, the Carver County Historical Society, the Chaska Historical Society, the Borchert Map Library at the University of Minnesota, and the St. Paul District, Corps of Engineers, library were consulted. In addition, the City of Chaska and the American Crystal Sugar Company were asked to provide information on past land use in Stages 3 and 4.

## APPENDIX A

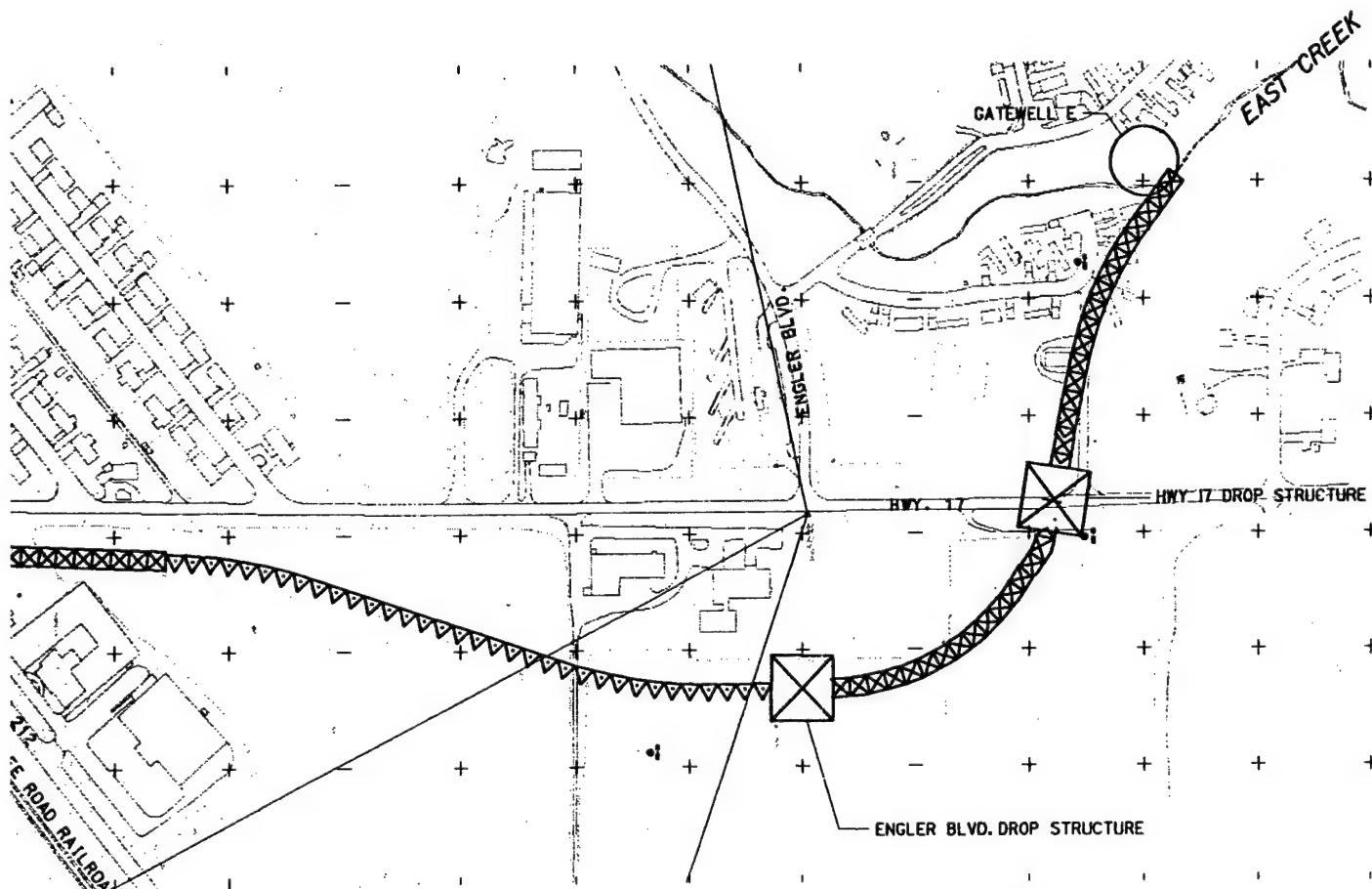






GENEF

200 0  
SCALE



**LEGEND**

DROP STRUCTURE

TRAPEZOIDAL RIPRAP CHANNEL

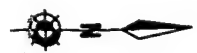
GRASS CHANNEL

CONCRETE CHANNEL

PARABOLIC DROP STRUCTURE



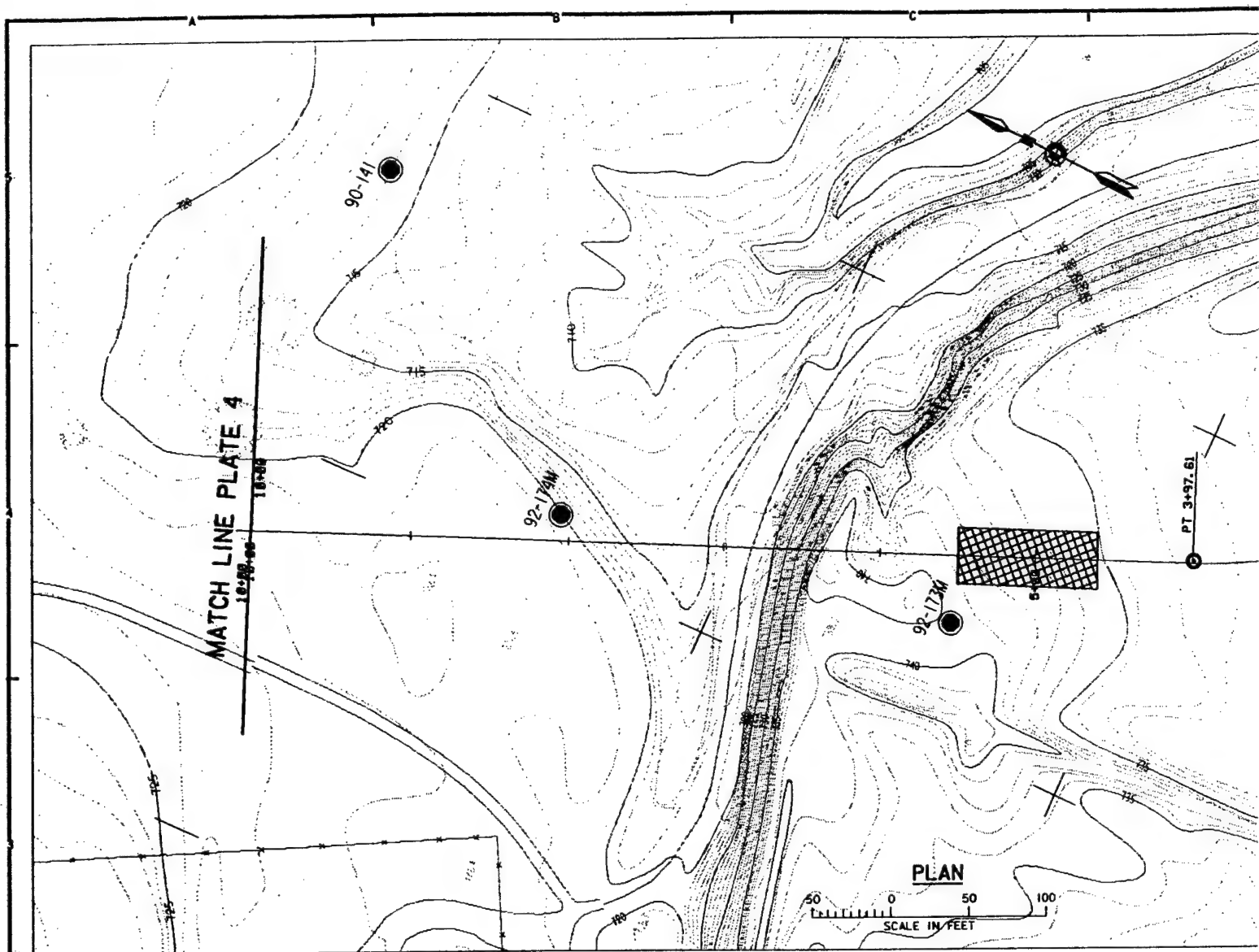
*Figure 2*

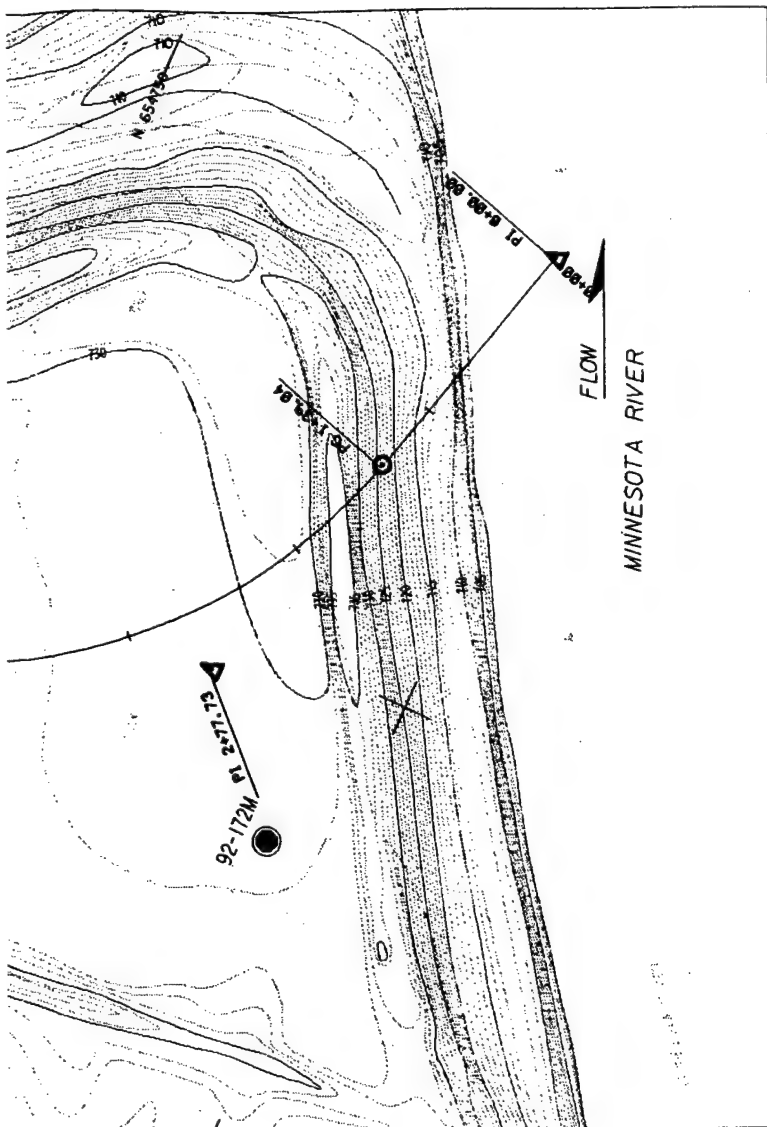


**GENERAL PLAN**

200 400  
FEET IN FEET

SYMBOL		DESCRIPTION		DATE	APPROVAL
<p align="center"><b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA</p>					
DESIGNED: TWH		<p align="center"><b>CHASKA PROJECT</b> CHASKA, MINNESOTA</p>			
CHECKED: JG		<p align="center"><b>FLOOD CONTROL</b></p>			
DRAWN: T.J.		<p align="center"><b>GENERAL LAYOUT PLAN</b></p>			
DESIGNED:		CAD FILE NAME: CH3GENPL.DGN		DRAWING NUMBER:	SHT
CHECKED:		SPEC NO: ACW37-90-B-0000		PLATE 2	OF 999
DATE: APRIL 1992					





REFERENCES:

DWG.NO.

NOTES:

17TH 72" RIPRAP  
4" RIPRAP  
1" RIPRAP

CHANNEL BOTTOM WIDTH PROTECTION  
RIGHT BANK PROTECTION  
LEFT BANK PROTECTION

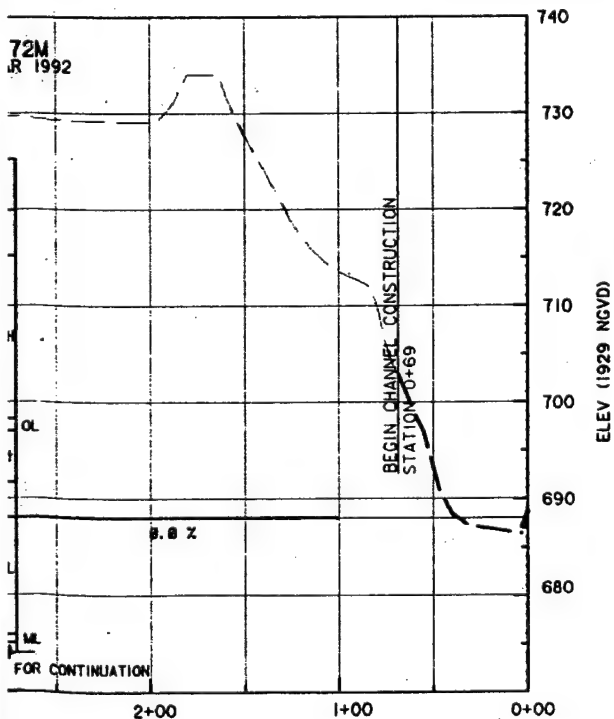


FIGURE 3

SYMBOL	DESCRIPTION	DATE	APPROVAL
<p>DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA</p>			
<p>AE APPROVING OFFICIAL:</p>		<p>DESIGN MEMORANDUM CHASKA - STAGE III EAST CREEK</p>	
<p>DESIGNED: TWH/JG CHECKED: JG DRAWN: T.J.</p>		<p>CHASKA PROJECT CHASKA, MINNESOTA</p>	
<p>ED-D DESIGNED: CHECKED:</p>		<p>FLOOD CONTROL PLAN &amp; PROFILE STA. 0+00 TO 10+00</p>	
<p>ED-CH DATE: 8-28-92</p>		<p>CAD FILE NAME: ch3pl.dgn</p>	<p>DRAWING NUMBER: PLATE 3</p>
<p>SPEC NO:</p>		<p>SHT X OF XX</p>	

MATCH LINE PLATE 3

18+88.0

90-137

90-136

91-148A

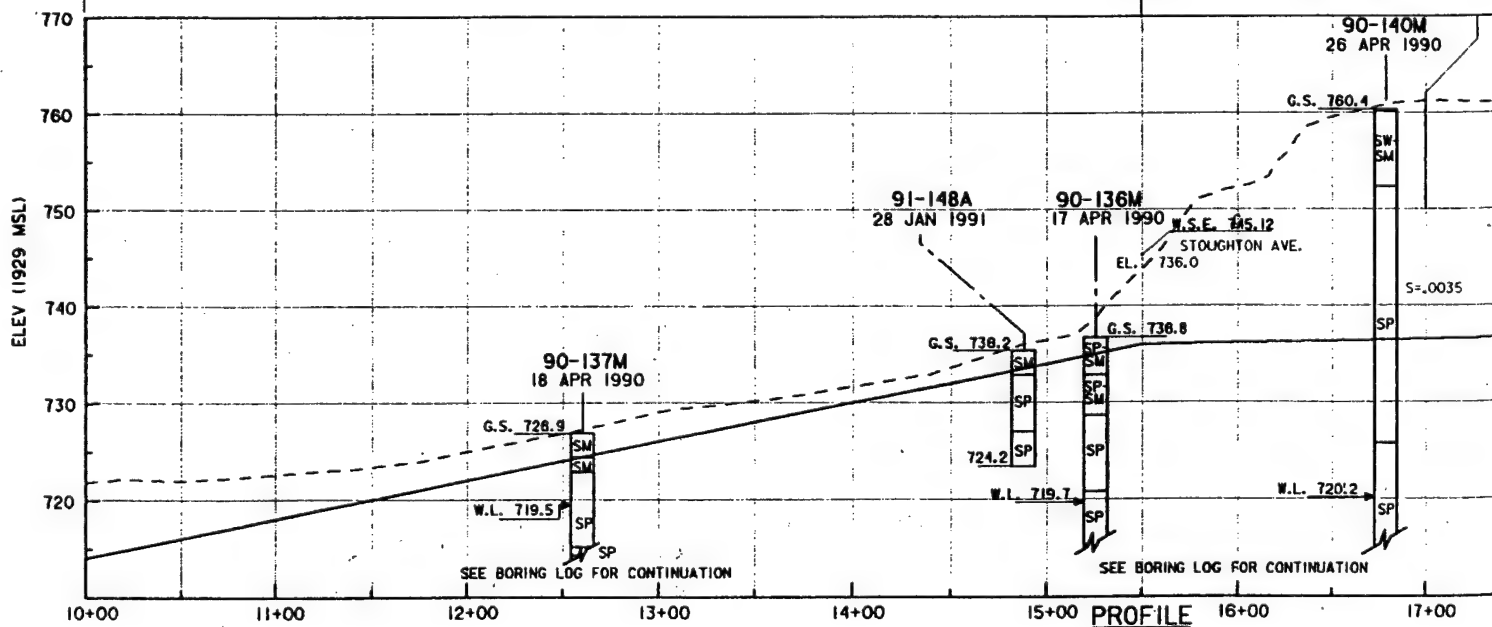
91-140

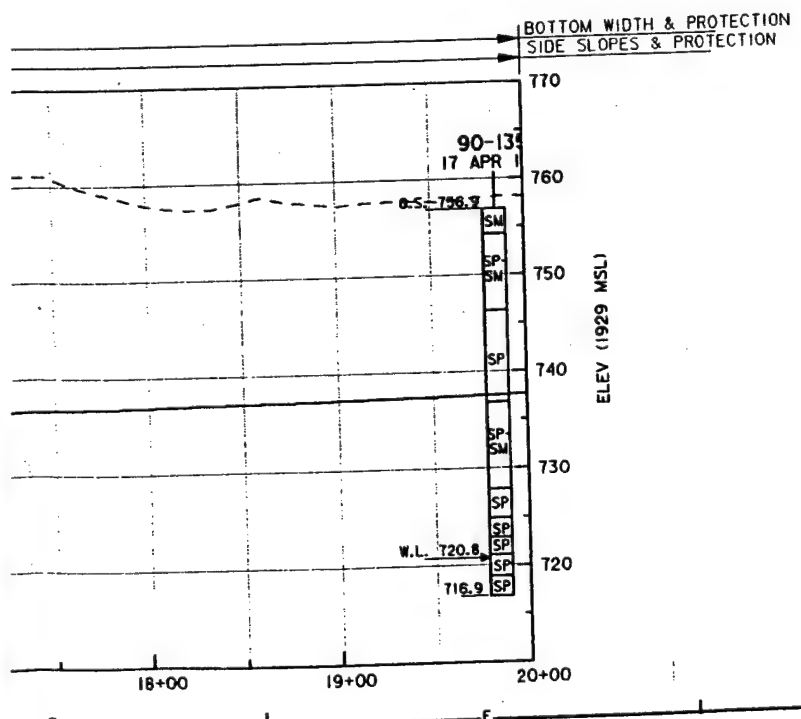
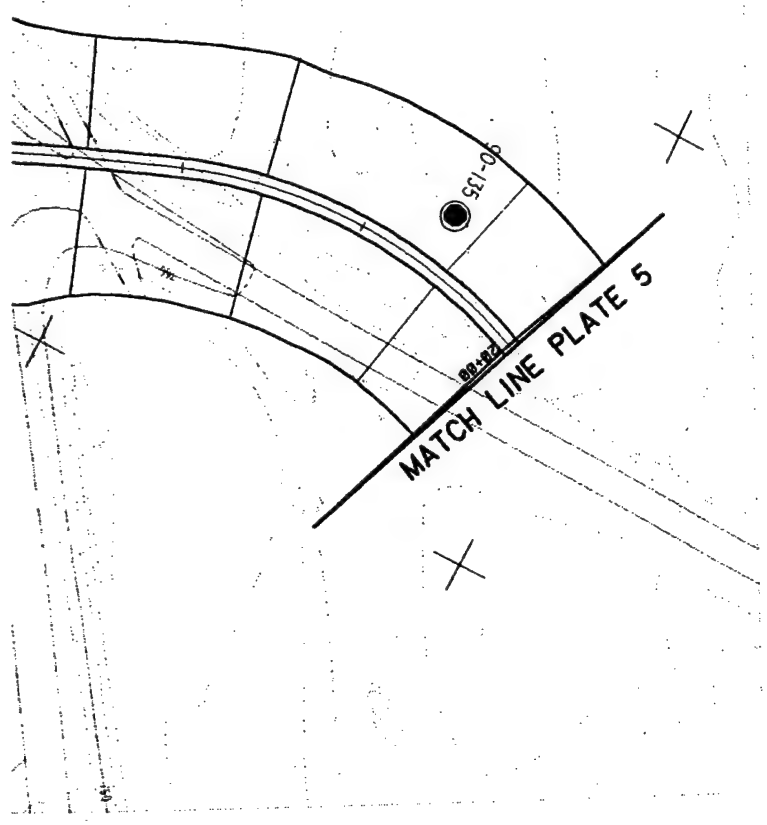
PLAN

50 0 50 100  
SCALE IN FEET

35' SUPERCRITICAL CONCRETE CHANNEL

10' (RIPRAP)  
IV ON 3H (RIPRAP)





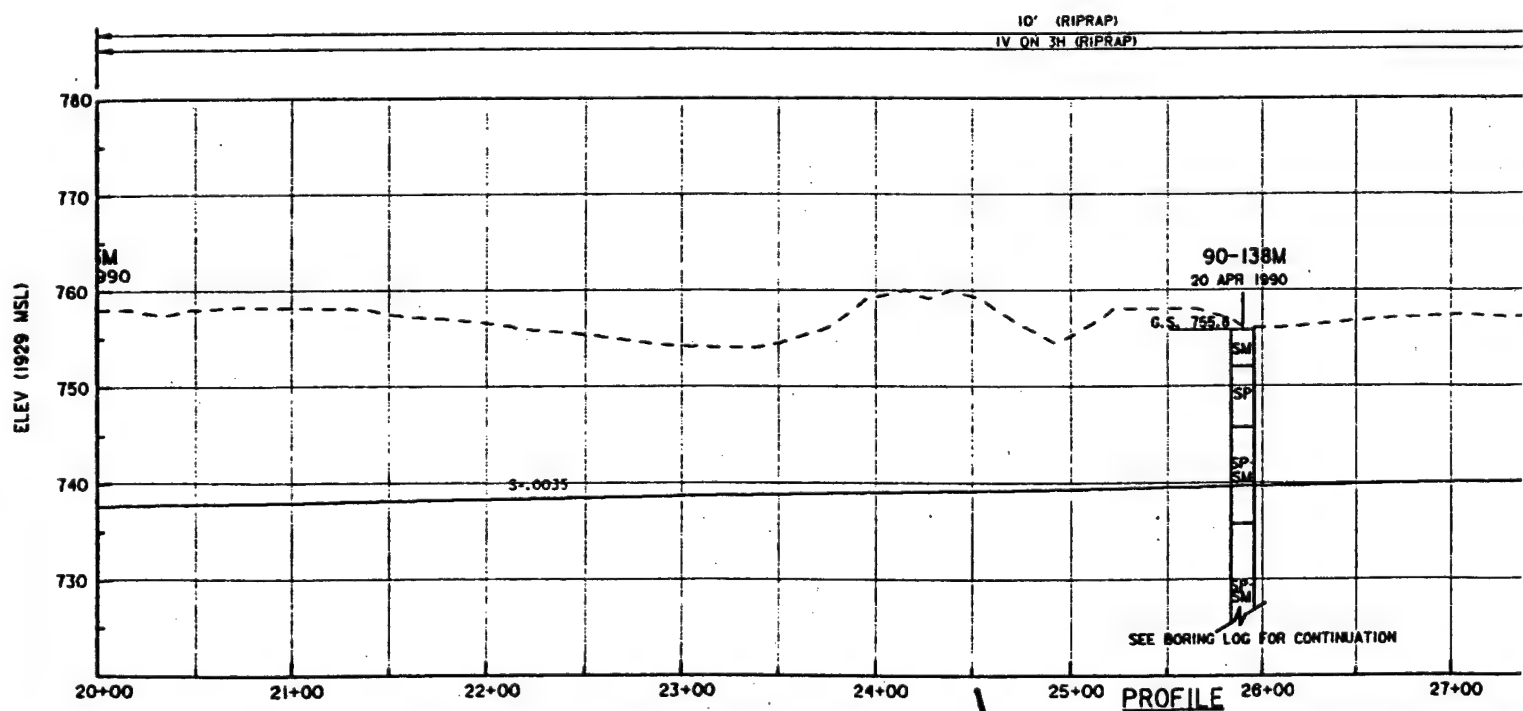
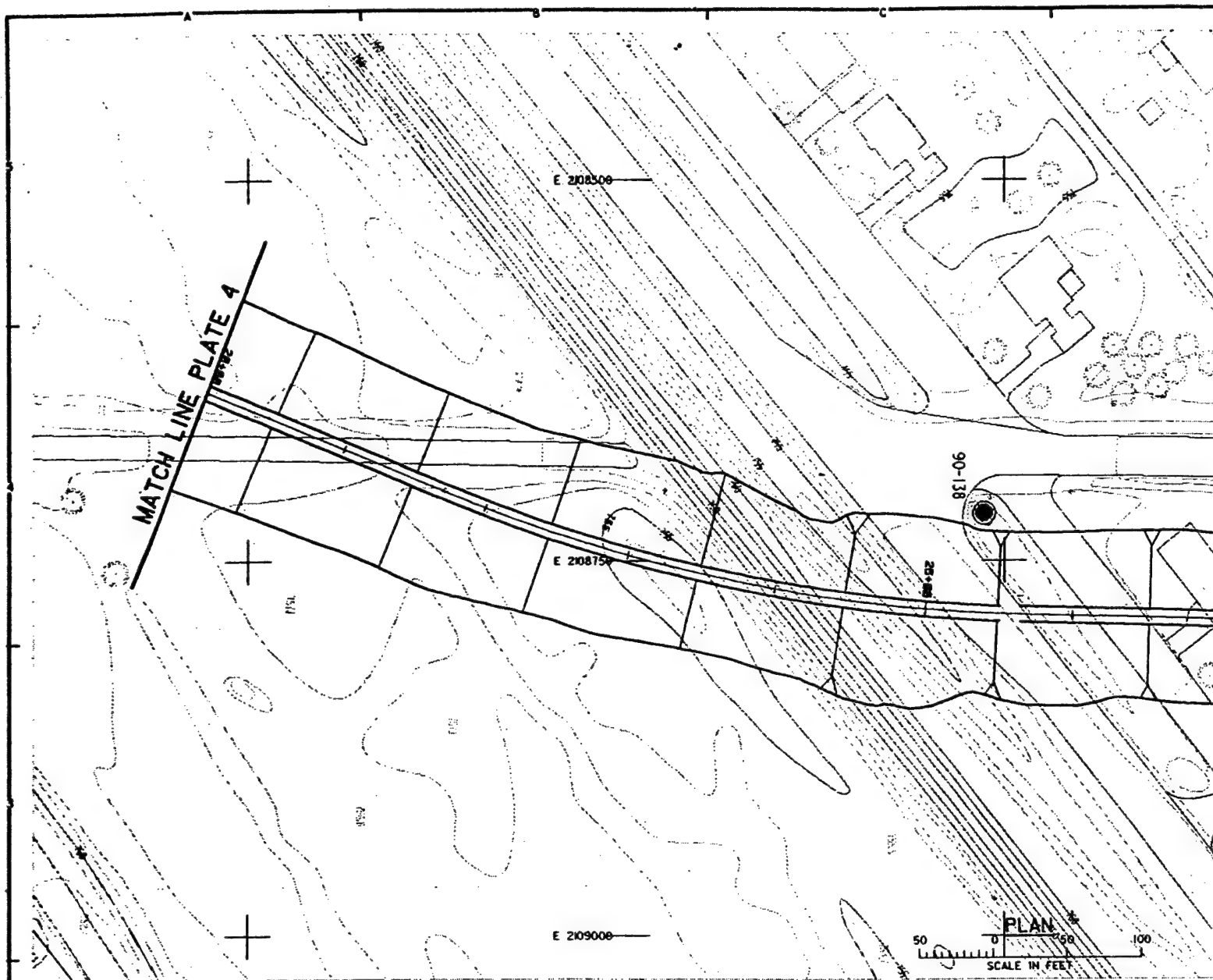
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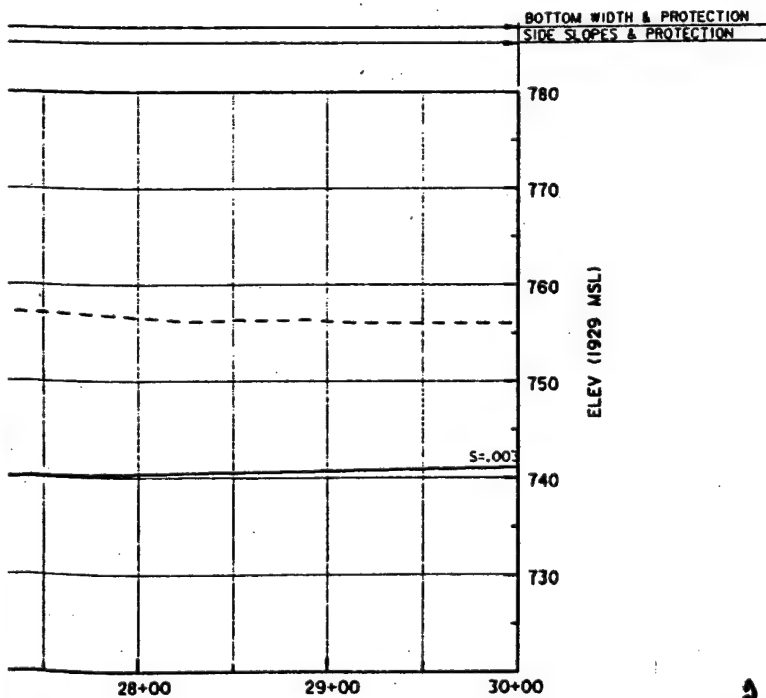
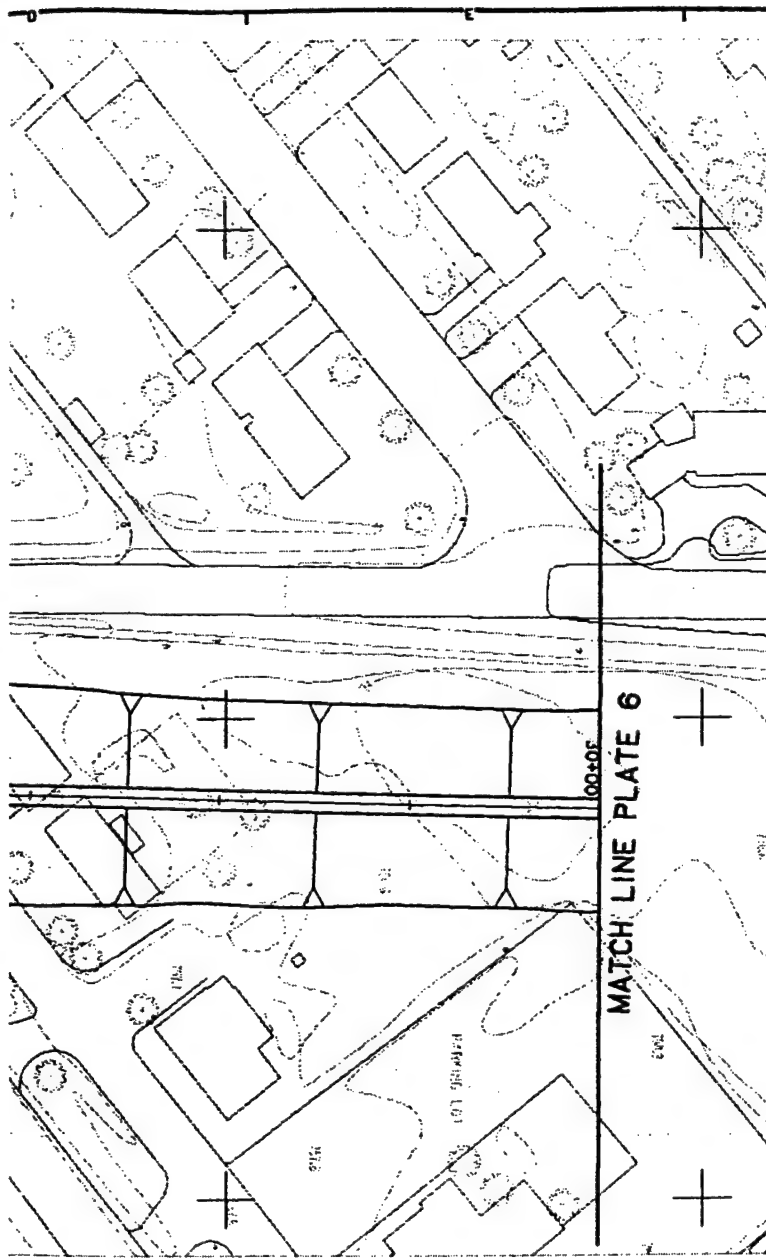
DWG.NO.

NOTES:

Figure 4

SYMBOL	DESCRIPTION	DATE	APPROVAL
<p align="center"><b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA</p>			
<p>AE APPROVING OFFICIAL:</p>		<p>DESIGN MEMORANDUM <b>CHASKA - STAGE III</b> EAST CREEK CHASKA, MINNESOTA</p>	
<p>DESIGNED: TWH/JG CHECKED: JG DRAWN: T.J.</p>		<p><b>CHASKA PROJECT</b> <b>FLOOD CONTROL</b> PLAN &amp; PROFILE STA. 10+00 TO 20+00</p>	
<p>DATE: 4-17-92</p>		<p>CAD FILE NAME: ch3pl2.dgn SPEC NO: DACW37-91-B-XXXX</p>	<p>DRAWING NUMBER: <b>PLATE 4</b></p>
		<p>SHT X OF XX</p>	





# REFERENCES:

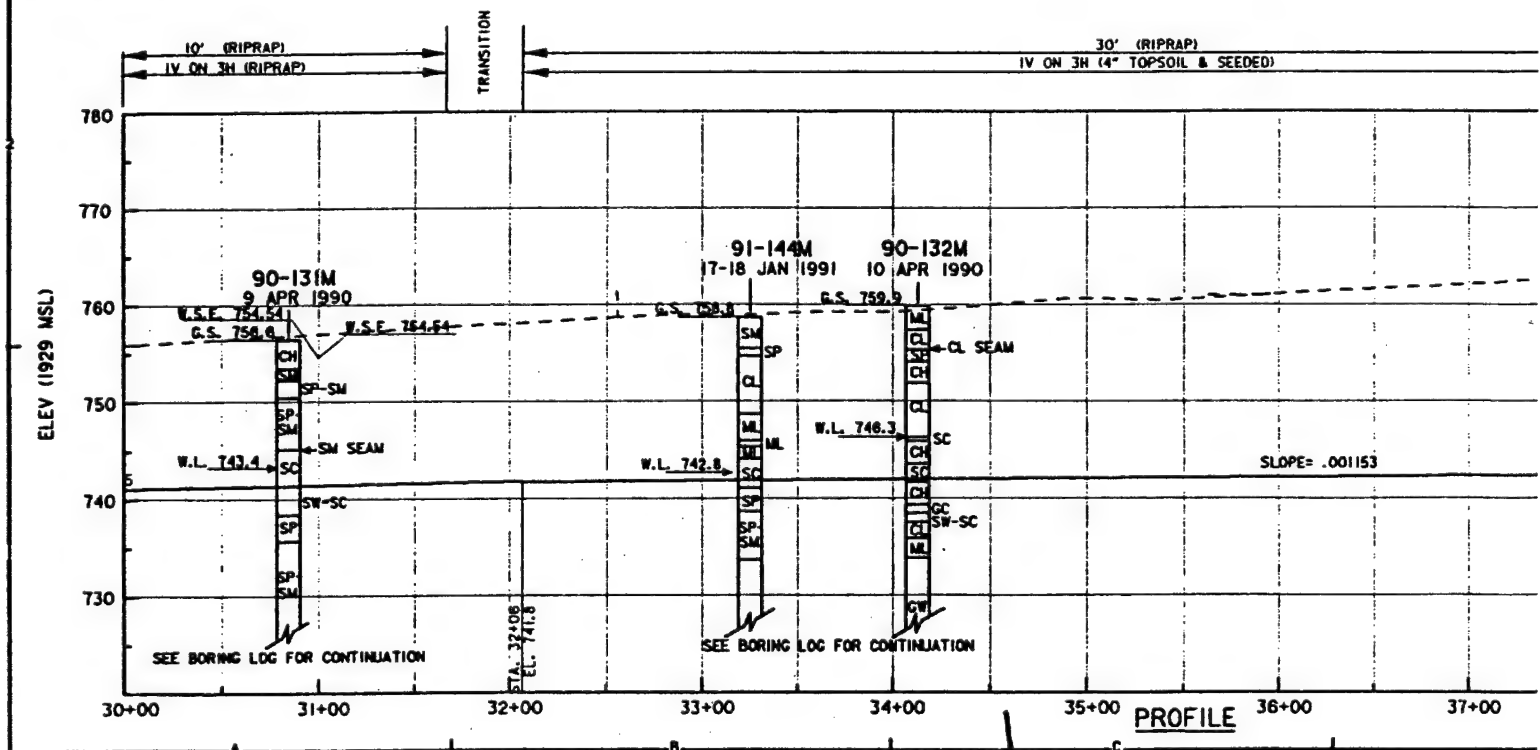
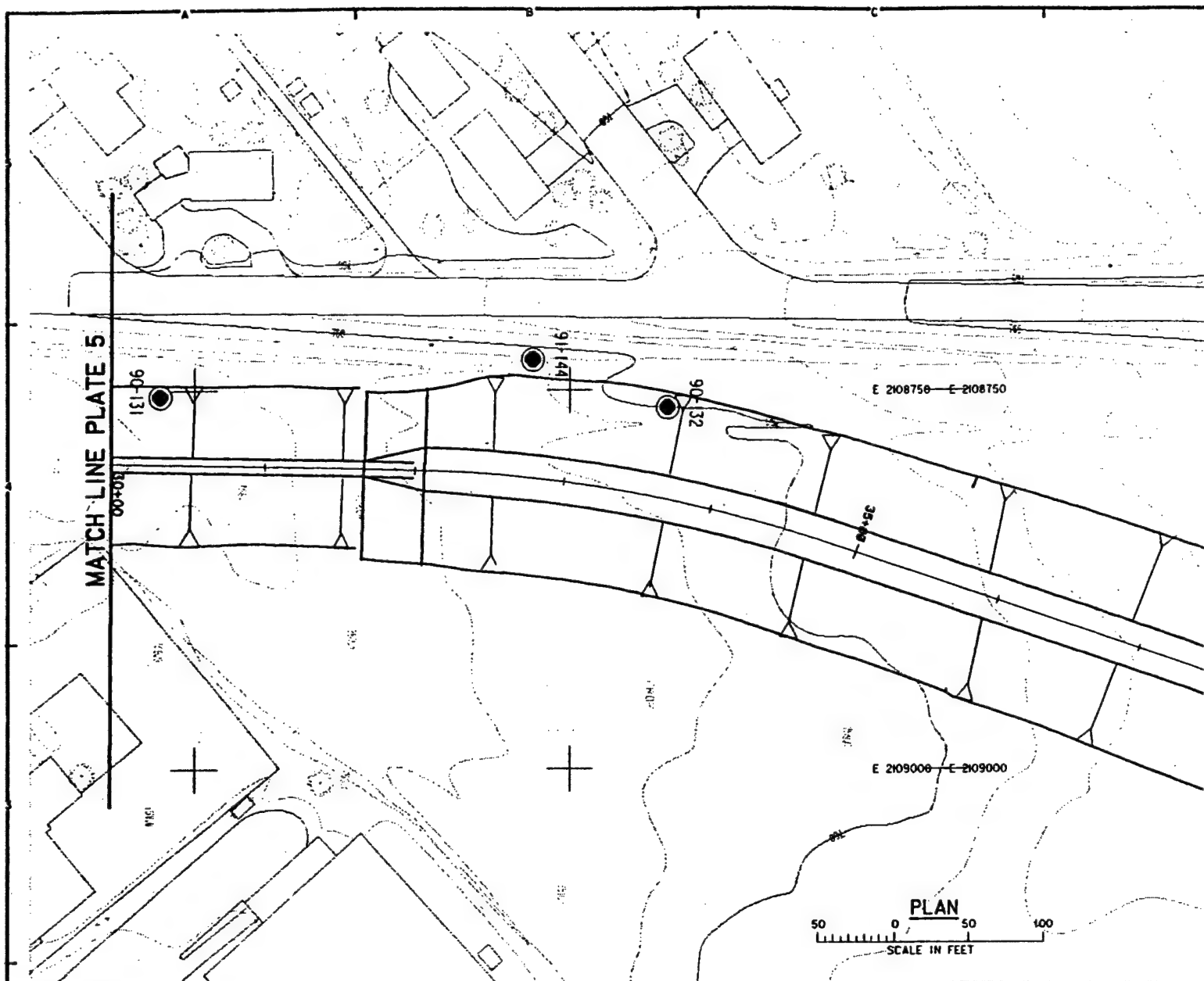
DWG.NO.

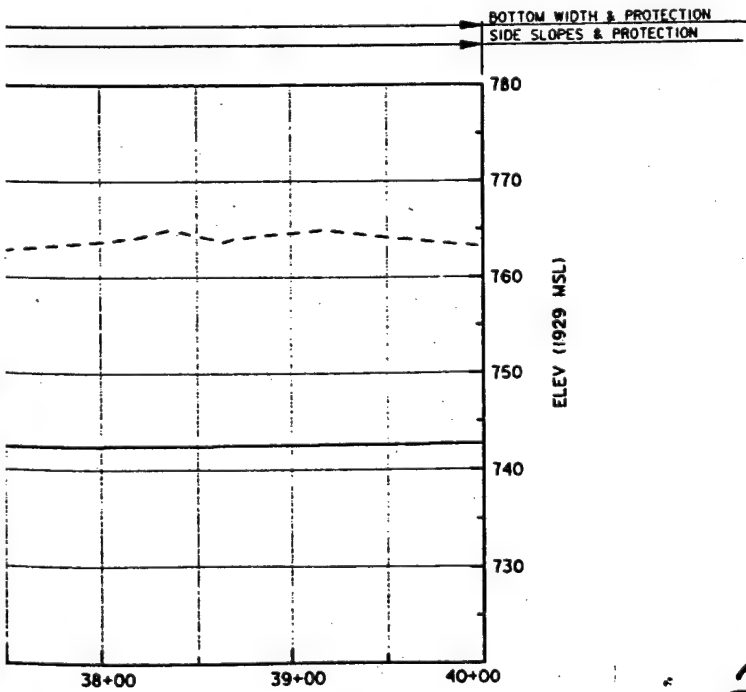
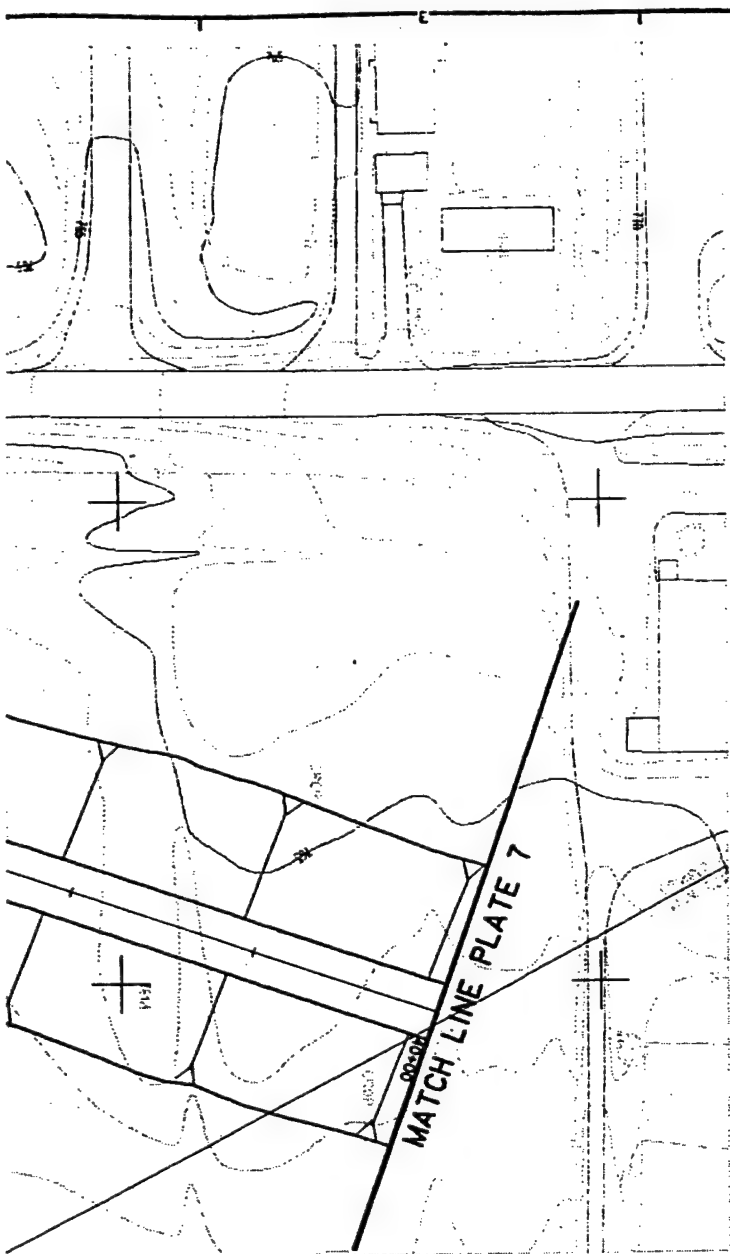
# NOTES:

FIGURE 5

SYMBOL		DESCRIPTION		DATE	APPROVAL
<p>DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA</p>					
<p>AE APPROVING OFFICIAL:</p>		<p>DESIGN MEMORANDUM CHASKA - STAGE III EAST CREEK</p>			
<p>CHASKA PROJECT</p>		<p>CHASKA, MINNESOTA</p>			
<p>DESIGNED: TWH/JC</p>		<p>FLOOD CONTROL</p>			
<p>CHECKED: JG</p>		<p>PLAN &amp; PROFILE</p>			
<p>DRAWN: T.J.</p>		<p>STA. 20+00 TO 30+00</p>			
<p>DESIGNED:</p>		<p>CAD FILE NAME: ch3p13.dgn</p>		<p>DRAWING NUMBER:</p>	
<p>CHECKED:</p>		<p>DATE: 4-17-92</p>		<p>SHT X</p>	
<p>SPEC NO: DACW37-9-B-XXXX</p>		<p>PLATE 5</p>		<p>OF XX</p>	







**REFERENCES:**

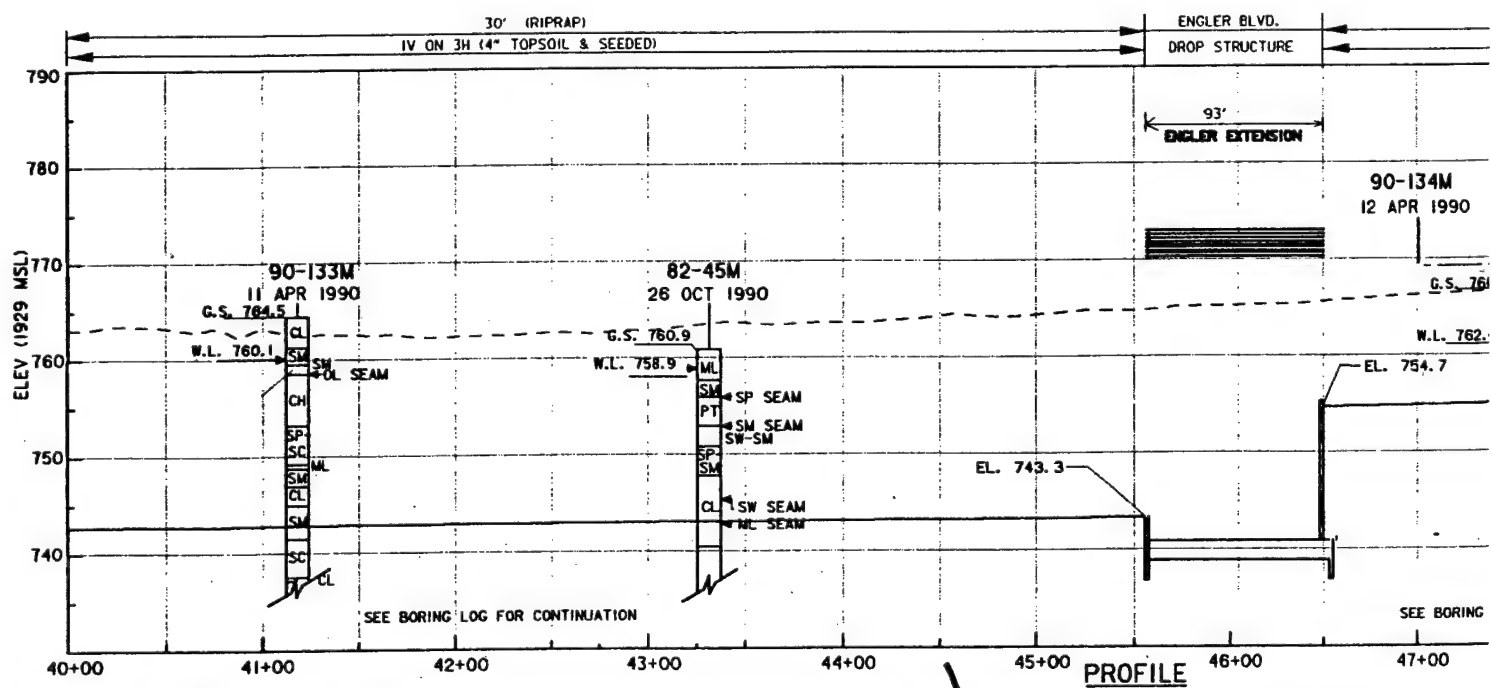
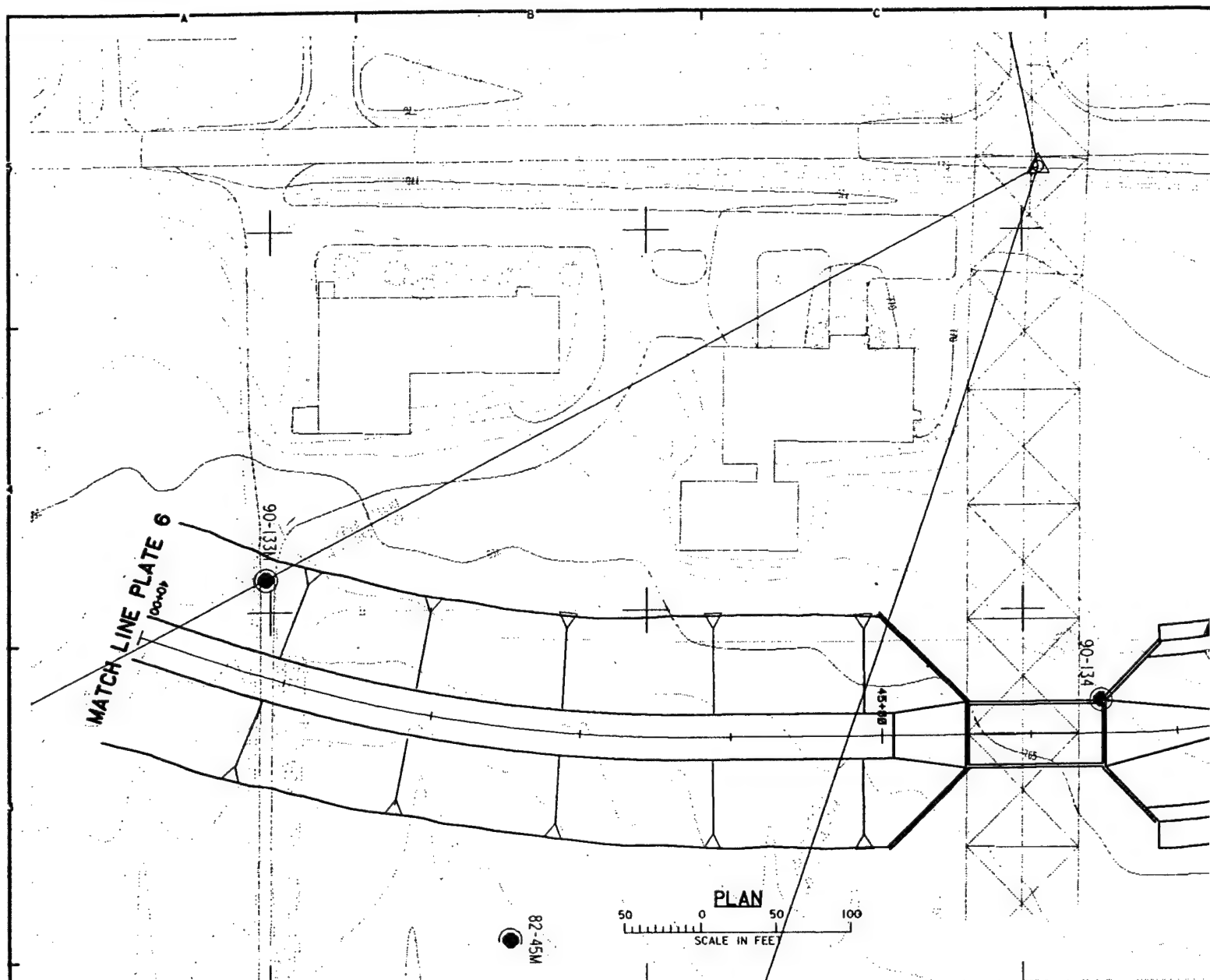
**DWG. NO.**

**NOTES:**

*FIGURE 6*

SYMBOL		DESCRIPTION		DATE	APPROVAL
<p align="center"><b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA</p>					
AE APPROVING OFFICIAL:		<p align="center">DESIGN MEMORANDUM <b>CHASKA - STAGE III</b> EAST CREEK CHASKA, MINNESOTA</p>			
E D C H	DESIGNED:	TWH/JG		CHASKA PROJECT	
	CHECKED:	JG		FLOOD CONTROL	
	DRAWN:	T.J.		PLAN & PROFILE	
	DESIGNED:			STA. 30+00 TO 40+00	
DATE:	4-17-92	CAD FILE NAME:	ch3p4.dgn	DRAWING NUMBER:	PLATE 6
		SPEC NO:	DACW37-91-B-XXXX	SHT	X
				OF	XX

2

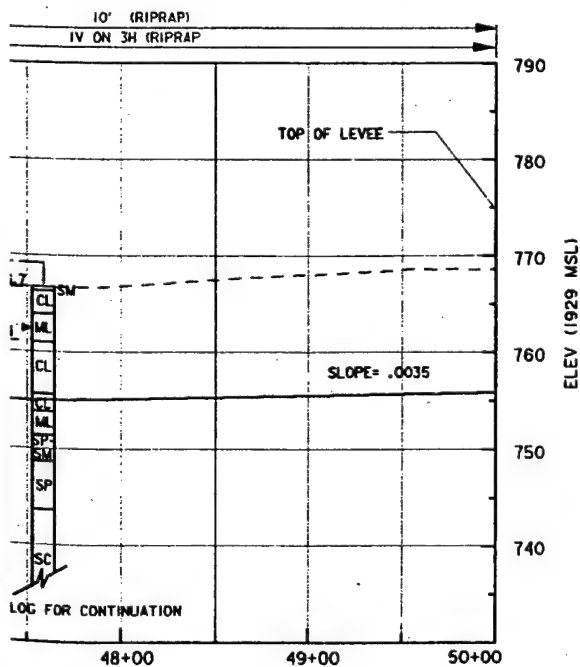


E 2108750 - E 2108750

E 2109000 - E 2109000

MATCH LINE PLATE 8

SIDE SLOPES & PROTECTION  
BOTTOM WIDTH & PROTECTION



REFERENCES:

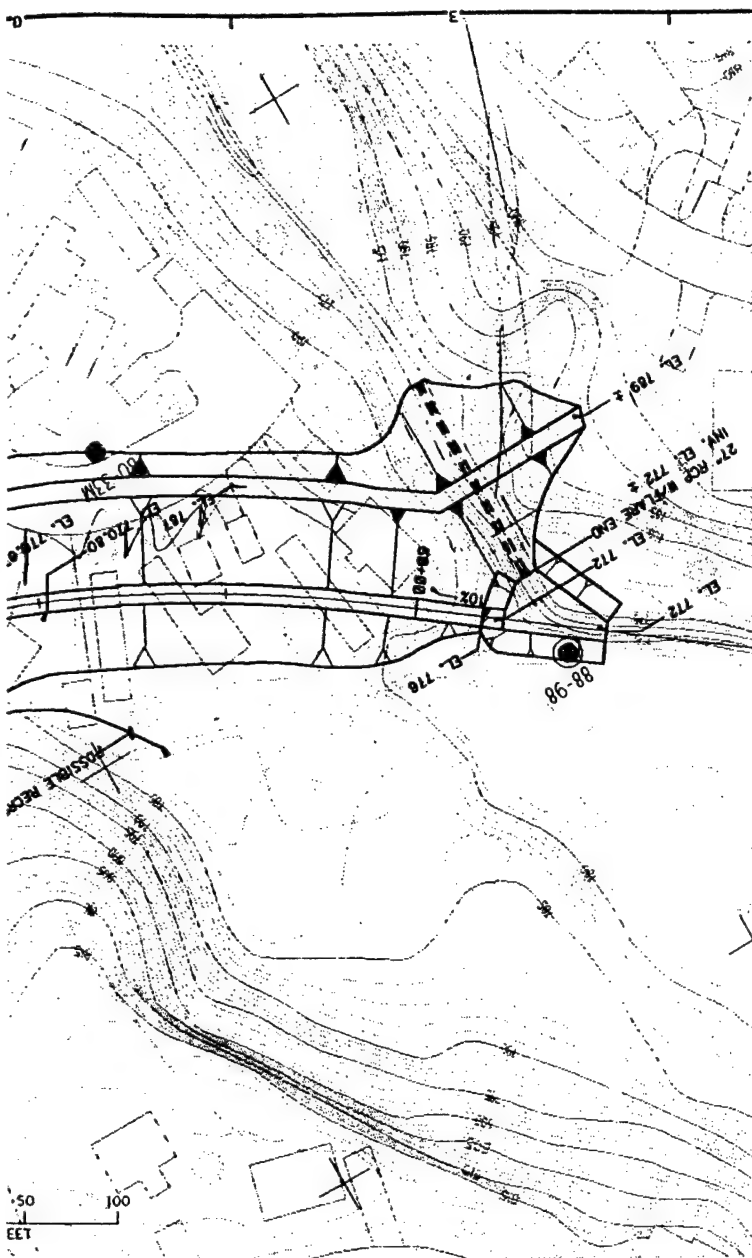
DWG.NO.

NOTES:

FIGURE 7

SYMBOL	DESCRIPTION	DATE	APPROVAL
<p>DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA</p>			
<p>AE APPROVING OFFICIAL:</p>		<p>DESIGN MEMORANDUM CHASKA - STAGE III EAST CREEK</p>	
<p>CHASKA PROJECT</p>		<p>CHASKA, MINNESOTA</p>	
<p>FLOOD CONTROL</p>			
<p>PLAN &amp; PROFILE STA. 40+00 TO 50+00</p>			
DESIGNED:	TWH/JG	CAD FILE NAME:	ch3pi5.dgn
CHECKED:	JG	SPEC NO:	DACW37-91-B-XXXX
DRAWN:	T.J.	DRAWING NUMBER:	PLATE 7
DATE:	4-17-92	SHT	K
		OF	XX





# REFERENCES:

DWG.NO.

# NOTES:

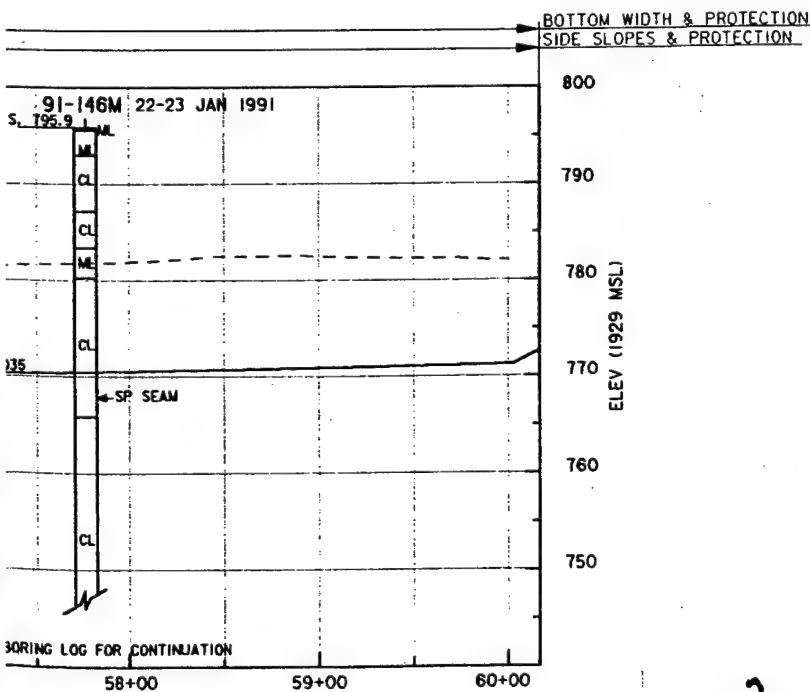
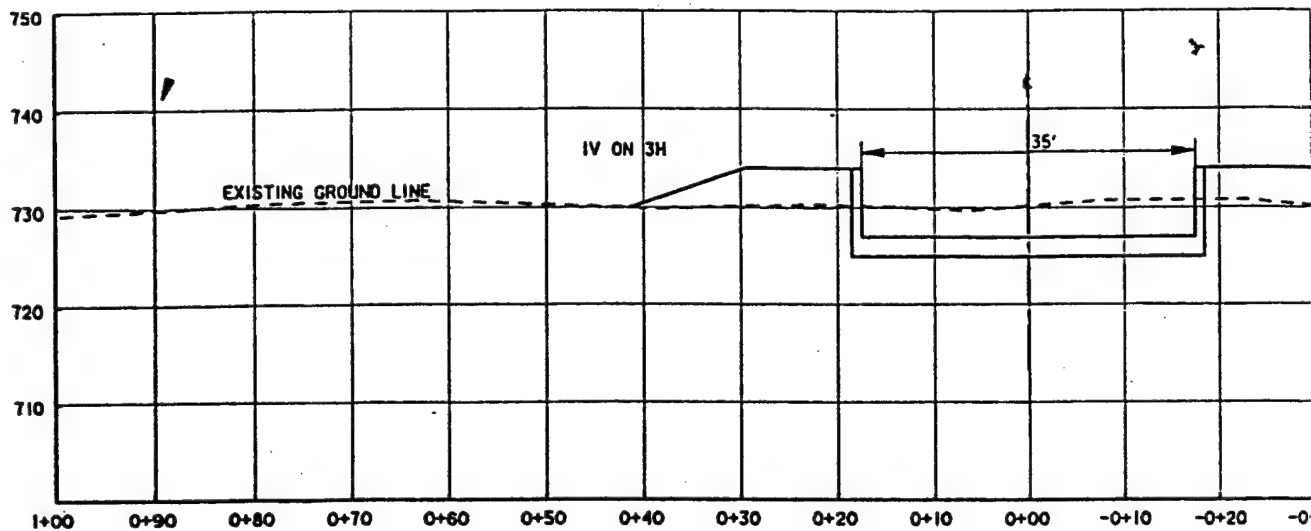


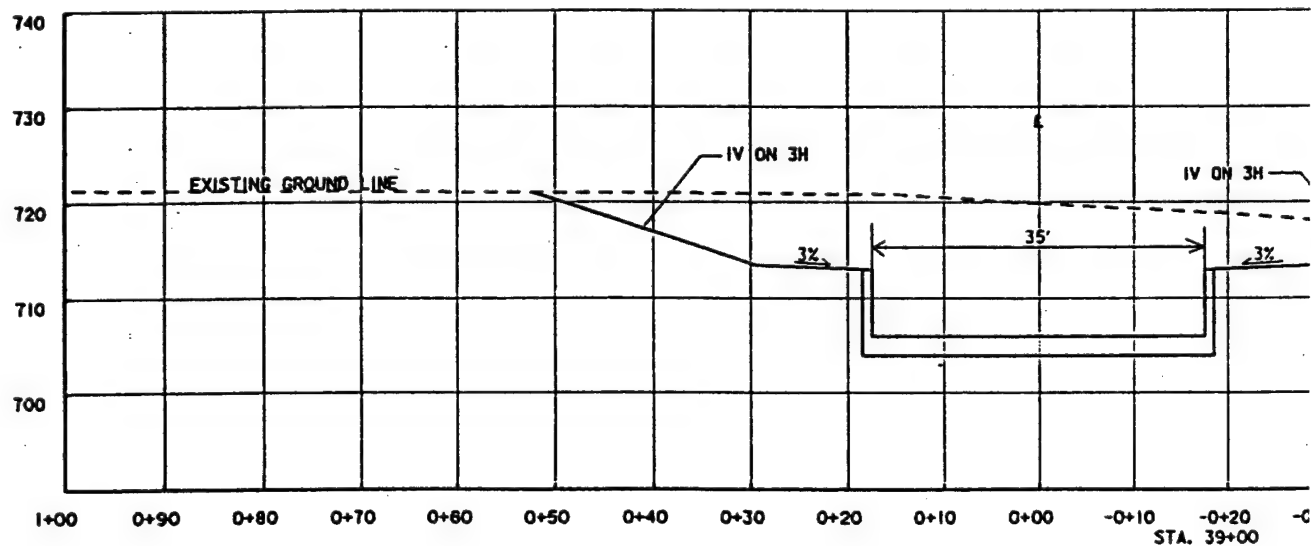
FIGURE 8

SYMBOL		DESCRIPTION		DATE	APPROVAL
<p align="center"><b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA</p>					
AE APPROVING OFFICIAL:		<p align="center">DESIGN MEMORANDUM <b>CHASKA - STAGE III</b> EAST CREEK CHASKA, MINNESOTA</p>			
DESIGNED: TWH/JC		CHASKA PROJECT			
CHECKED: JG		FLOOD CONTROL			
DRAWN: T.J.		PLAN & PROFILE			
DESIGNED:		STA. 50+00 TO 60+00			
CHECKED:		CAD FILE NAME: ch3p16.dgn	DRAWING NUMBER:		SHT. 4
DATE: 4-17-92		SPEC NO: DACW37-91-B-XXXX	PLATE 8		OF 44



G  
99/999

TYPICAL SECTION  
STA. 11+00 TO 14+75



H  
99/999

TYPICAL SECTION  
STA. 7+00 TO 10+00

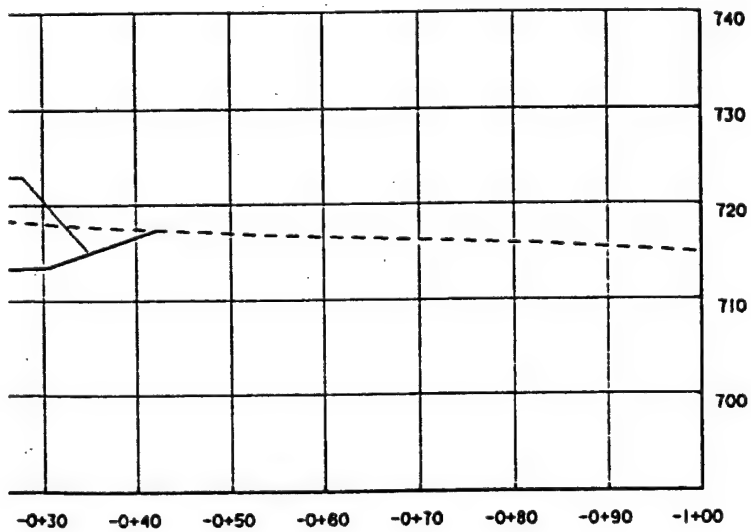
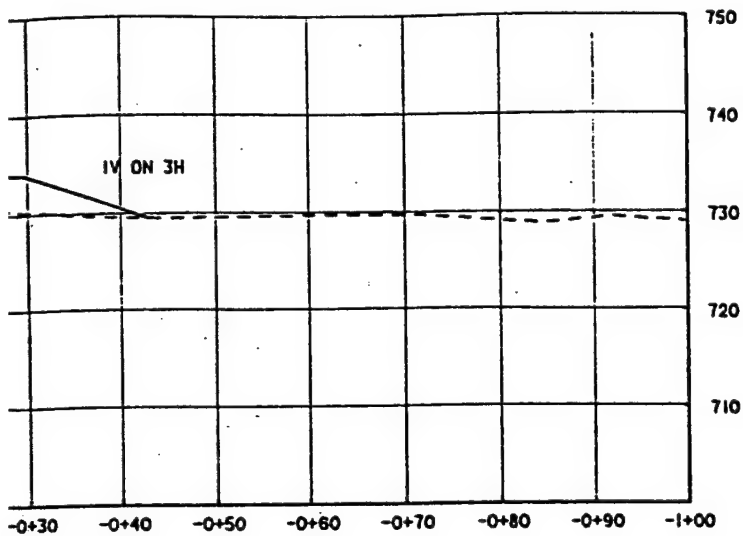
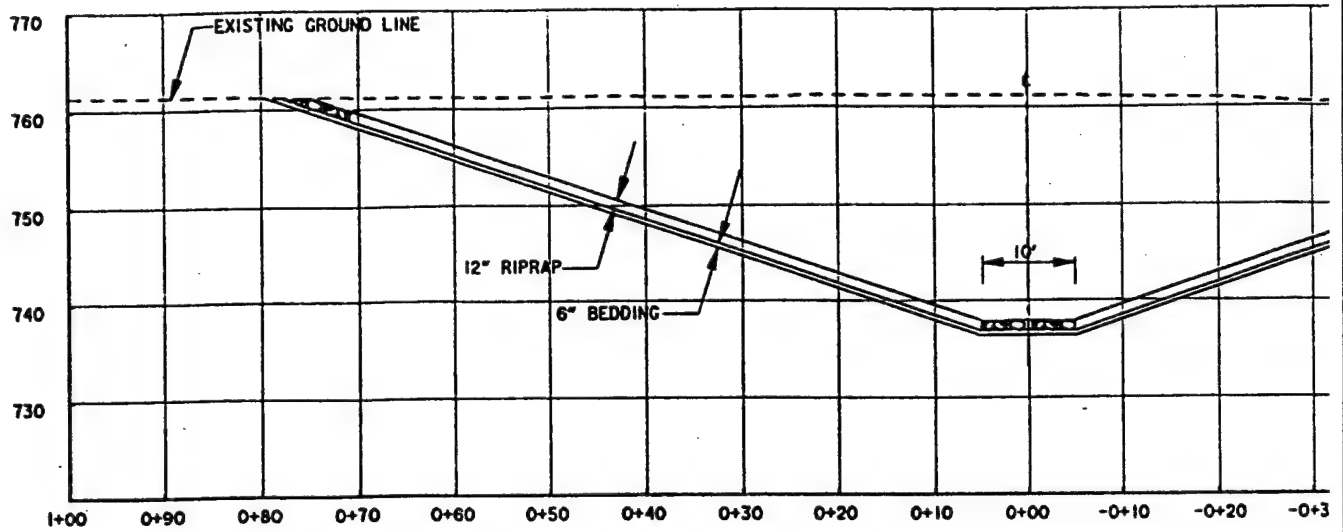


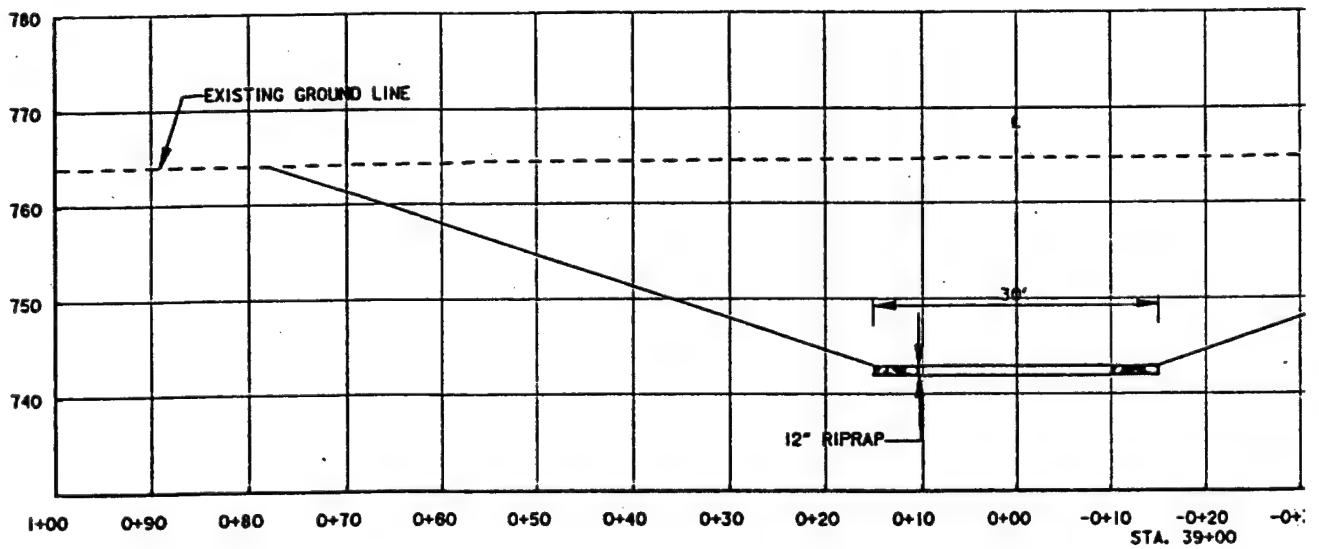
FIGURE 9

SYMBOL		DESCRIPTION		DATE	APPROVAL
DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA					
AE APPROVING OFFICIAL: _____					
ED-D	DESIGNED:				
	CHECKED:				
	DRAWN:				
	DESIGNED:				
ED-D	CHECKED:	CAD FILE NAME: C33XSEC.DGN		DRAWING NUMBER:	SHT
	DATE:	SPEC NO:	10	OF	





G	SECTION
99/999	STOUGHTON AVE BRIDGE
	SCALE: AS SHOWN



H	TYPICAL SECTION
99/999	STA. 31+60 TO 44+60

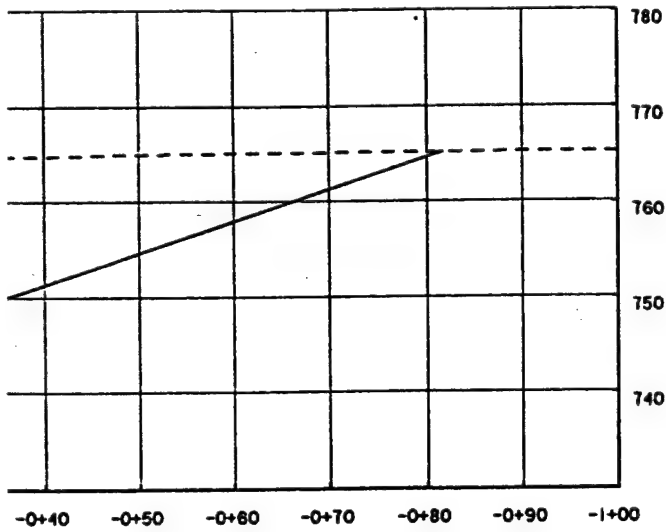
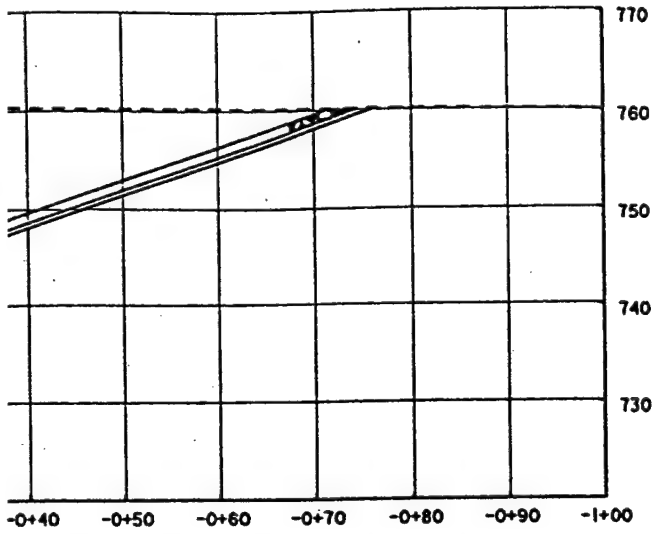
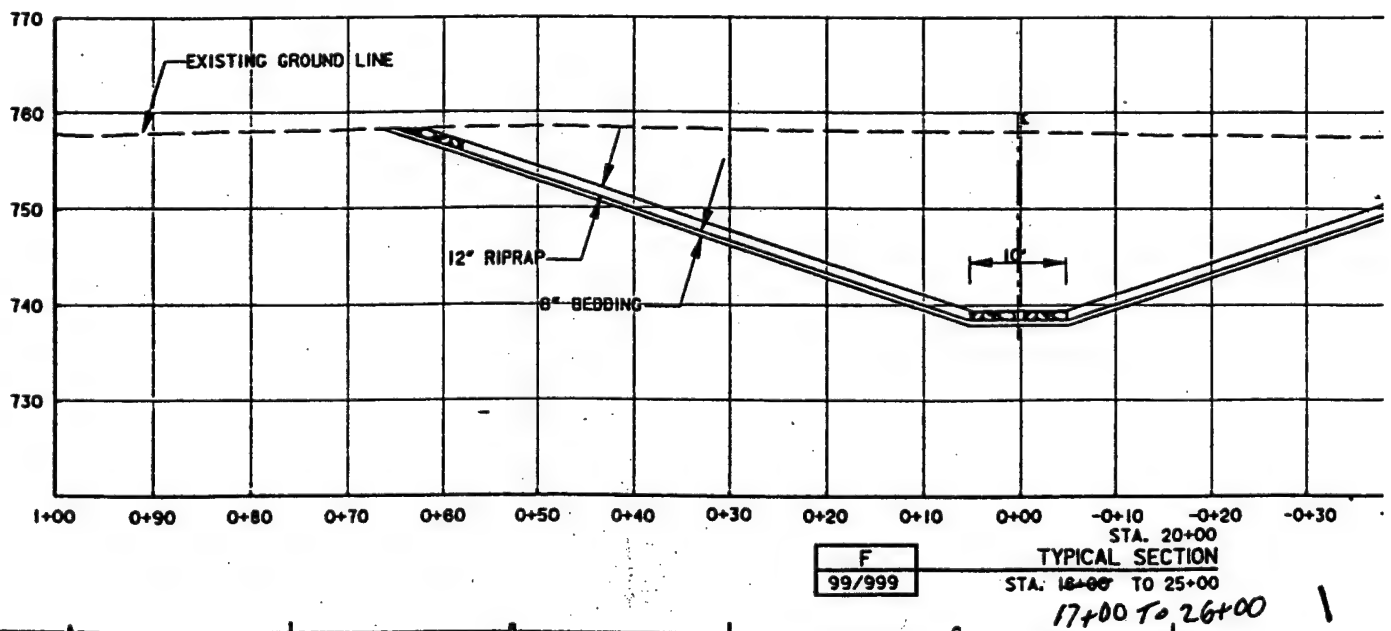
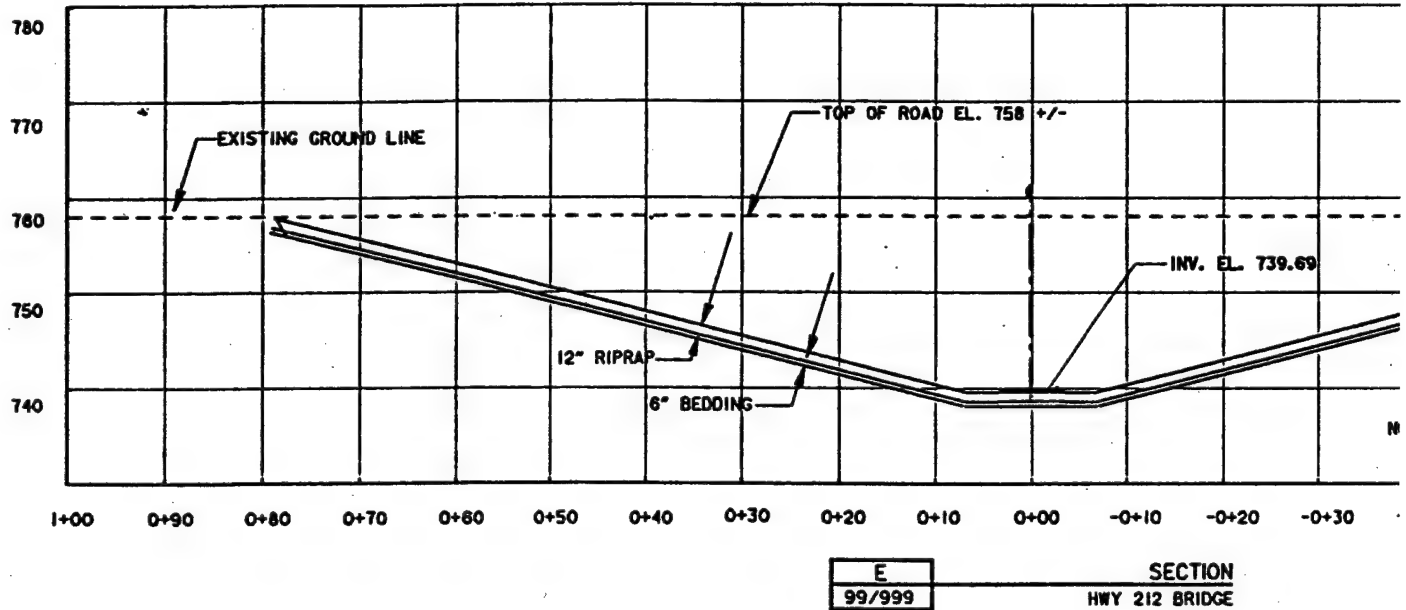
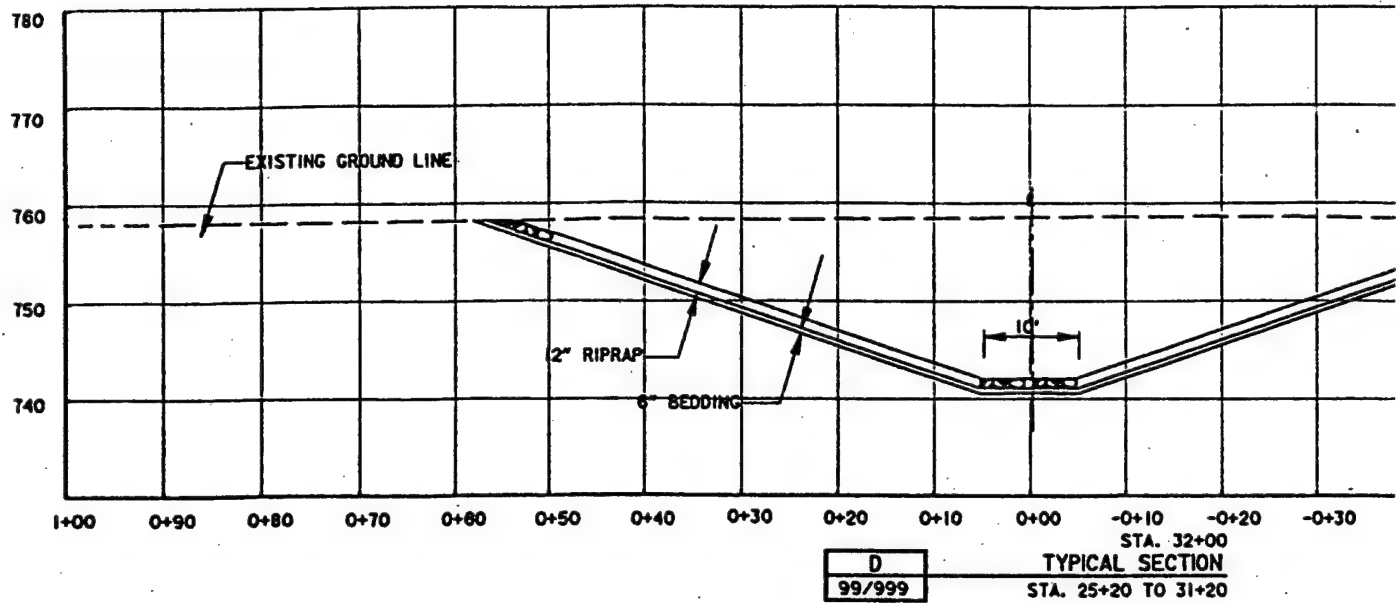


FIGURE 10

SYMBOL		DESCRIPTION		DATE	APPROVAL
		<b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
AE APPROVING OFFICIAL:  					
DESIGNED					
	CHECKED				
	DRAWN				
DATE		CAD FILE NAME: C33XSEC.DGN		DRAWING NUMBER:	SHT
		SPEC NO.		11	OF



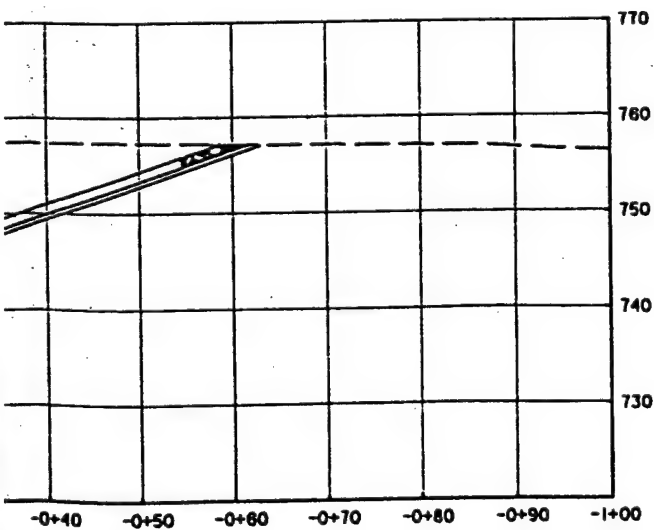
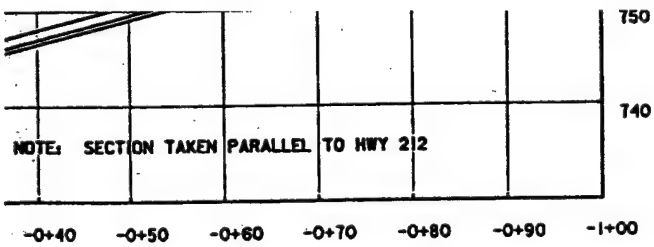
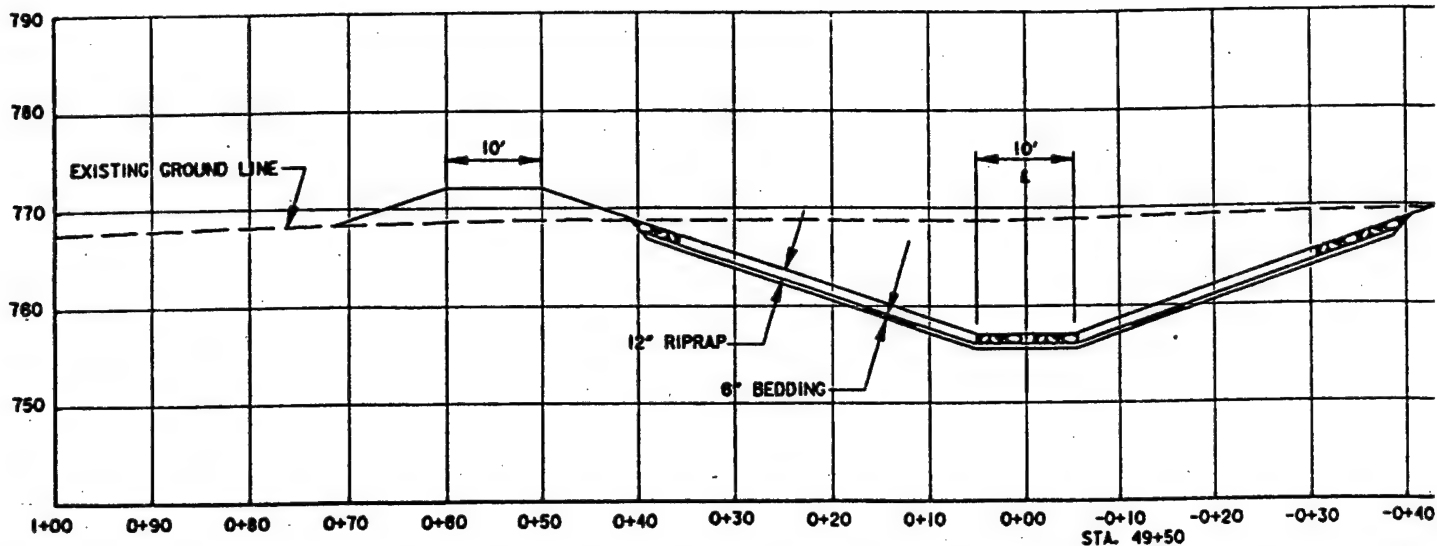


FIGURE 11

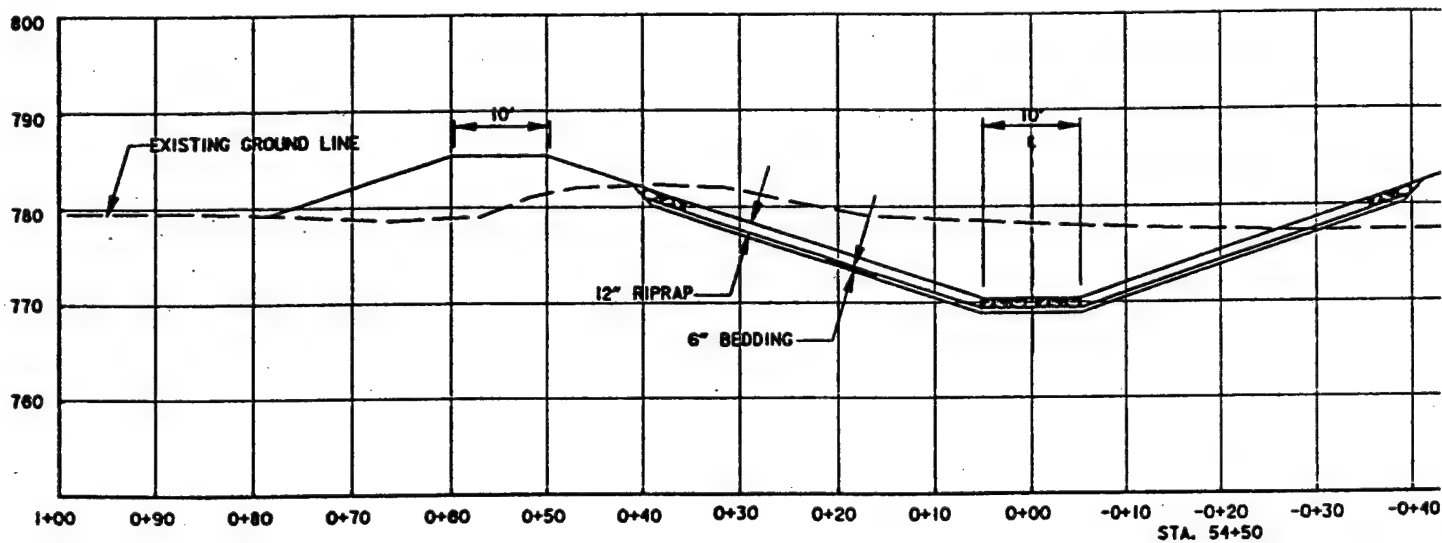
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
AS APPROVING OFFICIAL:			
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A  
99/999

TYPICAL SECTION  
STA. 51+75 TO 47+05

52+50 to 47+50



B  
99/999

TYPICAL SECTION  
STA. 53+50 TO 57+00

STA. 54+00 TO 58+00

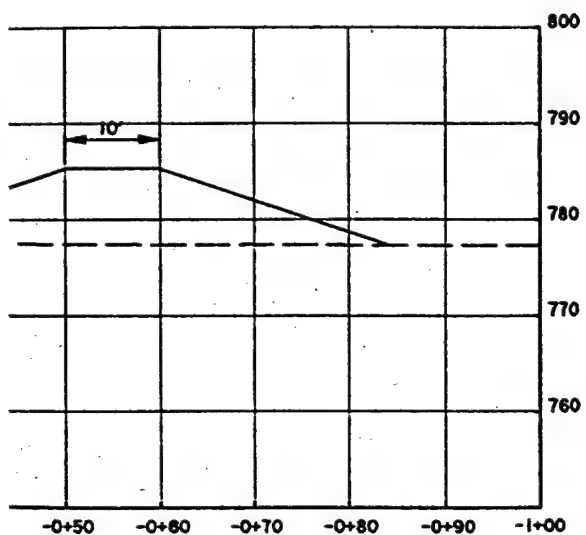
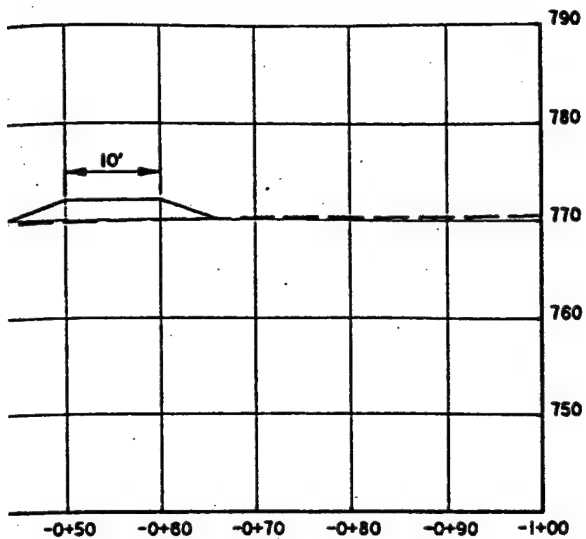
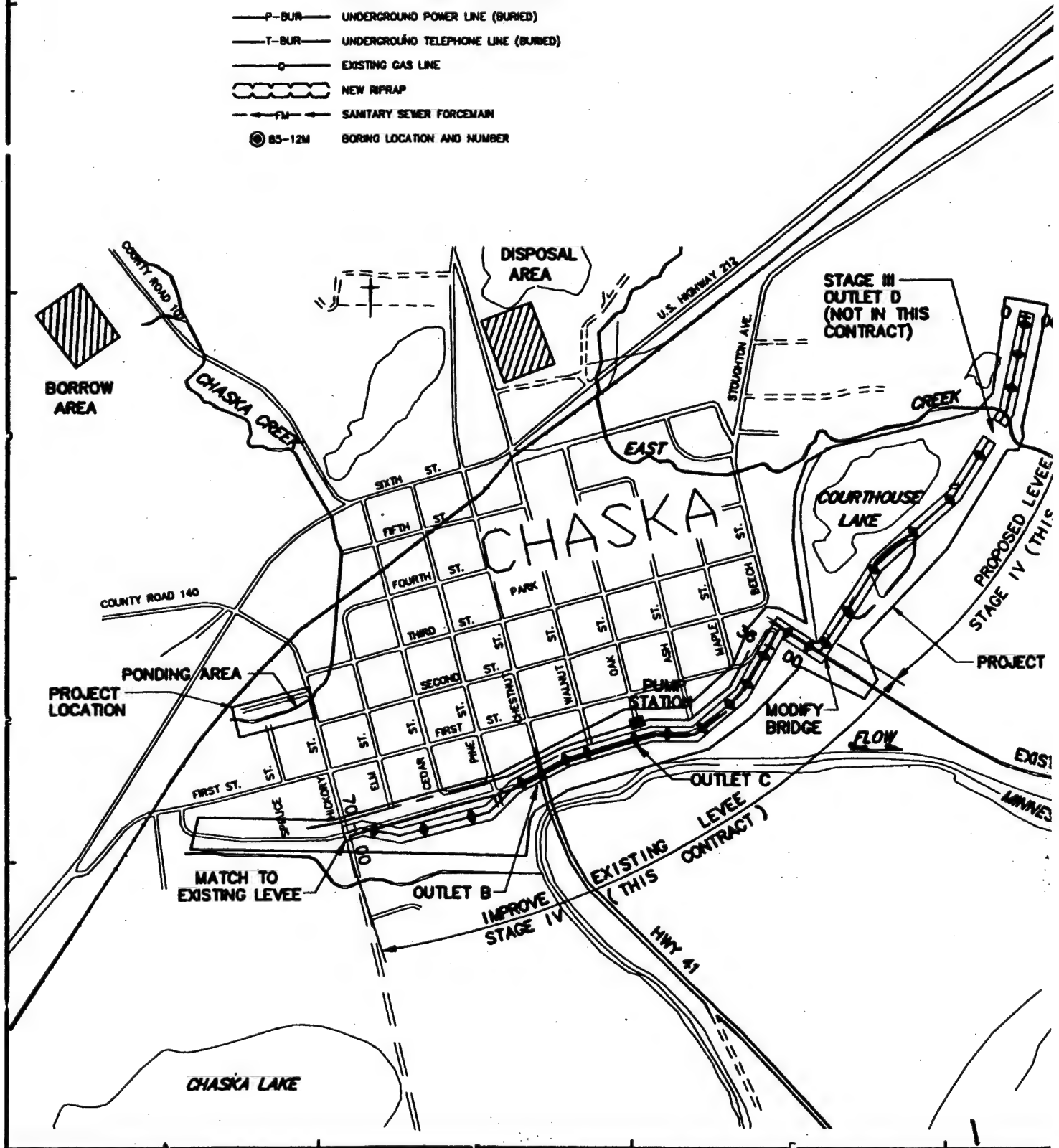


FIGURE 12

SYMBOL	DESCRIPTION	DATE	APPROVAL
<p>DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA</p>			
<p>AE APPROVING OFFICIAL:</p>			
DESIGNED:			
	CHECKED:		
	DRAWN:		
DESIGNED:			
	CHECKED:		
	DATE:		
<p>CAD FILE NAME: C31XSEC.DGN</p>		<p>DRAWING NUMBER:</p>	<p>SHT</p>
<p>SPEC NO:</p>		<p>PLATE 13</p>	<p>OF</p>

# **LEGEND**

	LEVEE		DENOTES CUT
	EXISTING LEVEE		DENOTES FILL
	INTERCEPTOR PIPE		LIMITS OF WORK (TYP.)
	UNDERGROUND PETROLEUM PRODUCTS LINE		TYPICAL SECTION SECTION NUMBER DWG. NO. WHERE SECTION IS LOCATED
	UNDERGROUND STORM SEWER PIPE		TO SIDE DITCH INLET
	VALVE		EXISTING CULVERT
	EXISTING CONTOUR		SIDE DITCH
	EXISTING FENCE		
	POWER LINE & POWER POLE (OVERHEAD)		
	UNDERGROUND POWER LINE (BURIED)		
	UNDERGROUND TELEPHONE LINE (BURIED)		
	EXISTING GAS LINE		
	NEW RIPRAP		
	SANITARY SEWER FORCEMAIN		
	BORING LOCATION AND NUMBER		



# VERTICAL CONTROL

STD. 3" BRASS DISC ON TOP OF S.E. WINGWALL OF  
BRIDGE #9010, T.H. 41 OVER THE MINNESOTA RIVER.  
ELEVATION 728.22

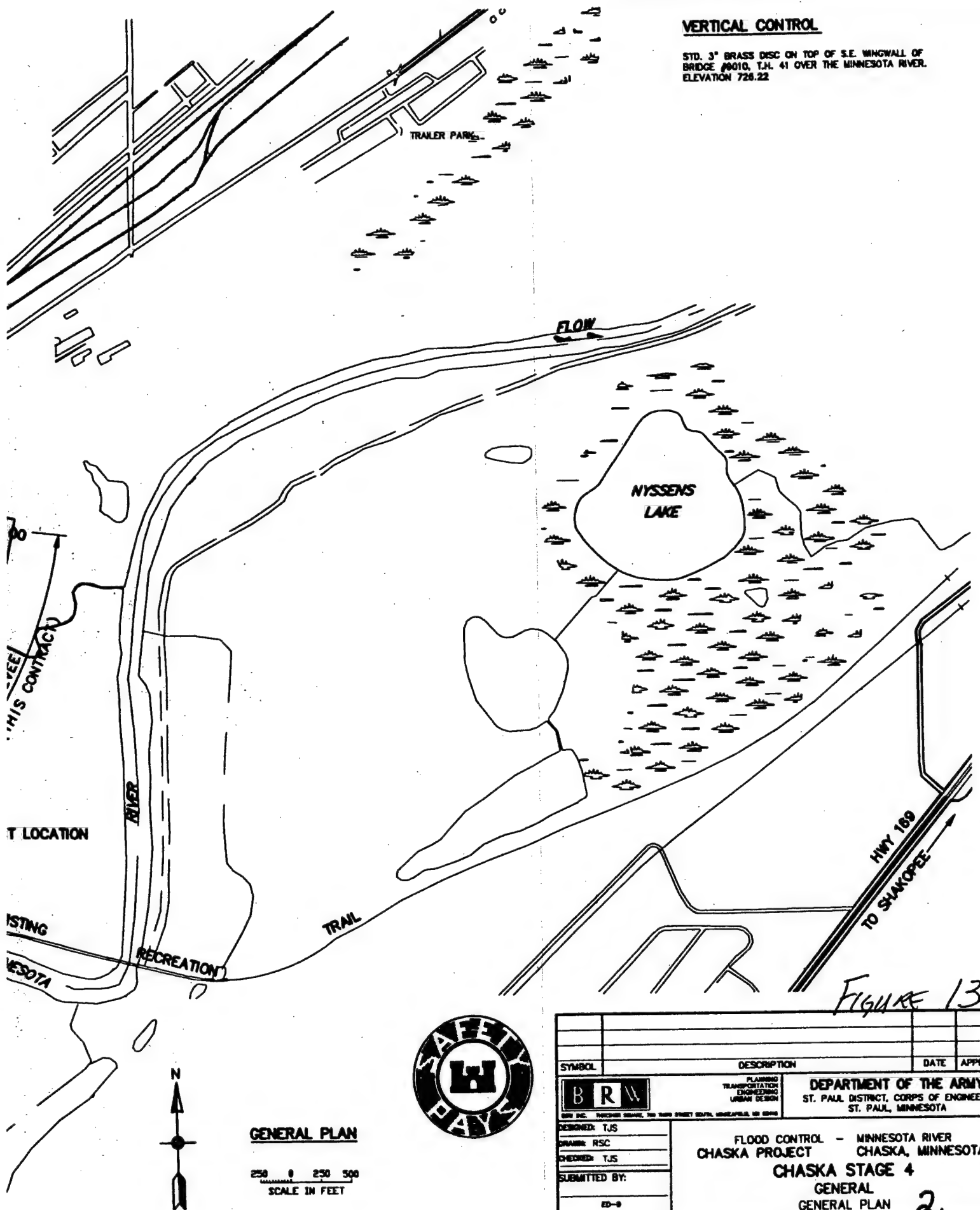


Figure 13.



## GENERAL PLAN

250 0 250 500  
SCALE IN FEET

SYMBOL	DESCRIPTION	DATE	APPROV.
<b>BRW</b>	PLANNING TRANSPORTATION ENGINEERING URBAN DESIGN		
DESIGNED: TJS		DEPARTMENT OF THE ARMY	
DRAWN: RSC		ST. PAUL DISTRICT, CORPS OF ENGINEERS	
CHECKED: TJS		ST. PAUL, MINNESOTA	
SUBMITTED BY:		FLOOD CONTROL - MINNESOTA RIVER	
ED-9		CHASKA PROJECT CHASKA, MINNESOTA	
ED-6H		CHASKA STAGE 4	
DATE: 07-29-92		GENERAL PLAN 2	
SPEC NO:		DRAWING NUMBER:	
		M34-CH-R-10/201	
		SHEET 2 OF 119	





# VERTICAL CONTROL POINT

BM-#1 - EL. 708.20 TOP OF LP.  
R/W MON. P-180

## NOTES:

- ELEVATIONS REFER TO M.S.L. (1929 ADJ.)
- COORDINATES AND GRID FOR PROJECT ARE LAMBERT GRID, MINNESOTA SOUTH ZONE.
- EXISTING TOPOGRAPHIC GROUND LINES MAY VARY FROM THOSE SHOWN ON PLANS.
- FILL EXISTING EAST CREEK TO EL. 705.0 UPON COMPLETION OF EAST CREEK REALIGNMENT.
- REMOVE & STOCKPILE TOPSOIL, PLACE 5" CL 5 AGGREGATE FOR HAUL ROAD NORTH OF LEVEE. RESTORE TO ORIGINAL CONDITION UPON COMPLETION OF PROJECT.
- SIDE DITCH SLOPES VARY TO 6% MAX.
- PLACE 5" CL 5 AGGREGATE MATERIAL ON TOP OF LEVEE AFTER TRUCKS ARE DONE HAULING.
- MATCH EXISTING FARM ACCESS AT STATIONS 0+00E AND 7+75E.
- CONTRACTOR TO PLACE 2 - 48" CMP CULVERTS IN EAST CREEK REALIGNMENT, FOR TEMPORARY HAUL ROAD USE, TO BE REMOVED UPON COMPLETION OF PROJECT.
- PLACE SILT FENCE ALONG BOTH BANKS OF EAST CREEK REALIGNMENT, AS DIRECTED BY THE ENGINEER.
- TEMPORARY OPENING WILL BE COMPLETED AS OUTLET D, STAGE III DOCUMENTS.

## REFERENCES:

## DWG NO.

- |                                      |            |
|--------------------------------------|------------|
| 1. GENERAL PLAN                      | 10/201     |
| 2. LEVEE ALIGNMENT                   | 84/218     |
| 3. AGGREGATE TRAIL TYPICAL           | 84/238     |
| 4. TEMPORARY EROSION CONTROL DETAILS | 84/237     |
| 5. EAST CREEK ALIGNMENT              | 84/219     |
| 6. GUARDPOST BARRIER DETAIL          | 84/307     |
| 7. FARM ACCESS ALIGNMENT             | 84/218     |
| 8. MISCELLANEOUS CROSS-SECTIONS      | 84/313-315 |
| 9. FARM ACCESS PROFILE & SECTION     | 84/243     |
| 10. EAST CREEK PROFILE & SECTION     | 84/244     |

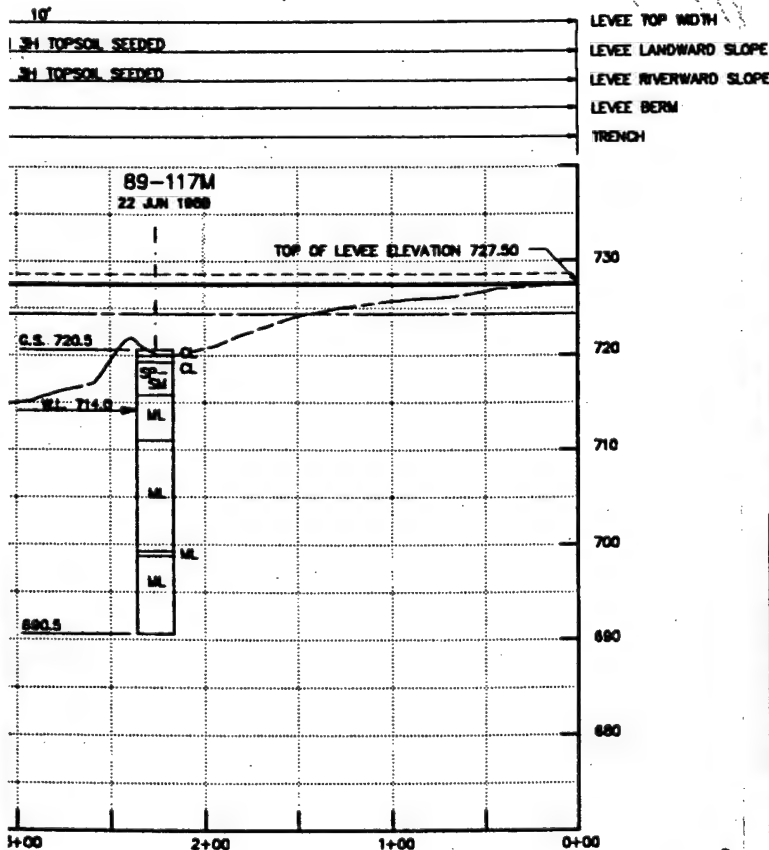
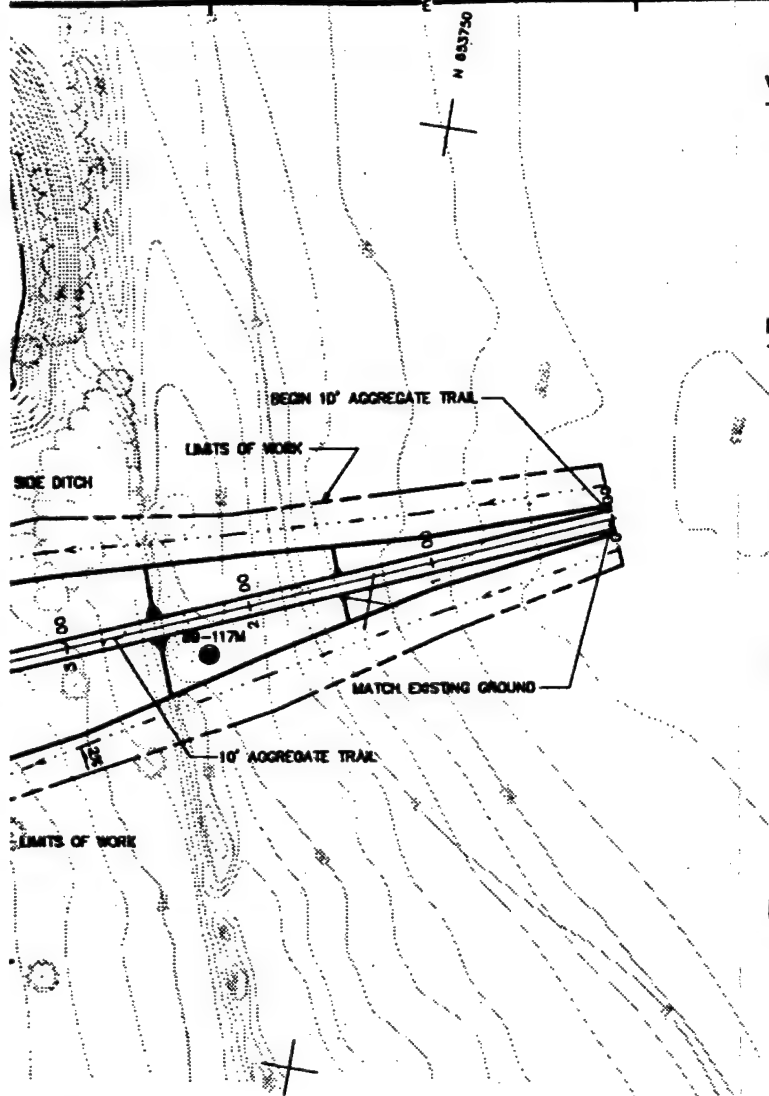
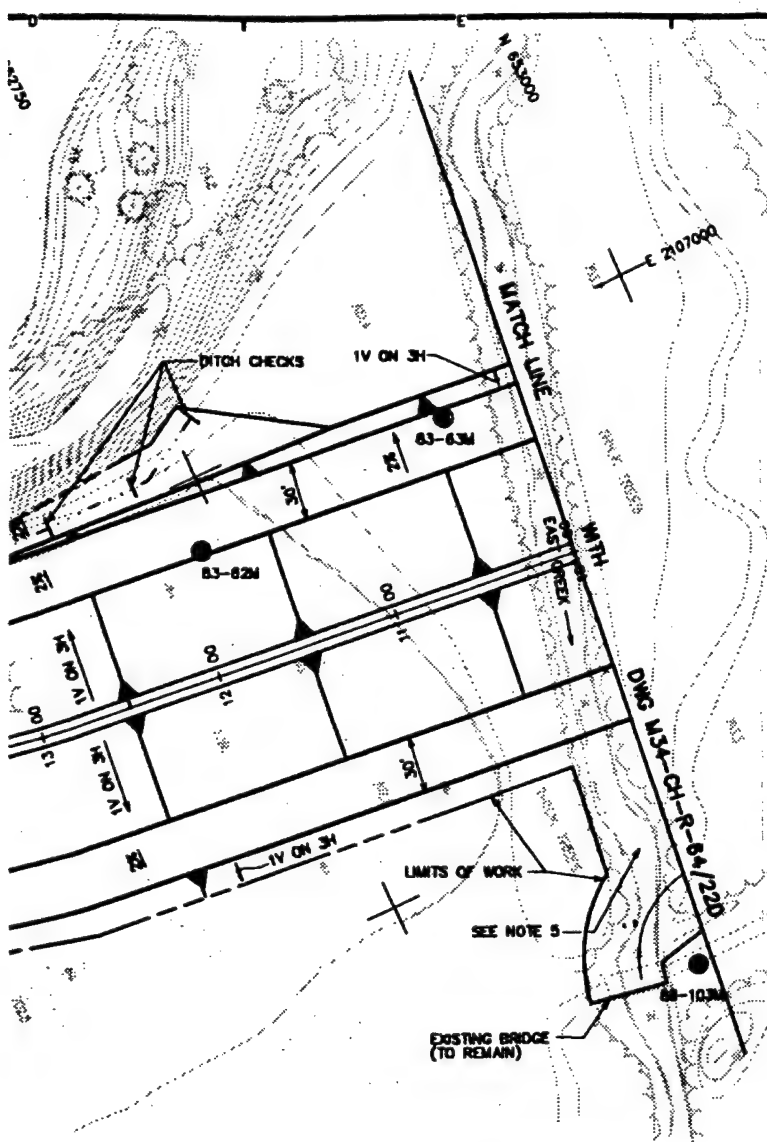


Figure 14

SYMBOL	DESCRIPTION	DATE	APPROVAL
<p align="center"><b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA</p>			
<p align="center"><b>FLOOD CONTROL - MINNESOTA RIVER</b> <b>CHASKA PROJECT CHASKA, MINNESOTA</b> <b>CHASKA STAGE 4</b> <b>DRAINAGE &amp; LEVEES</b> PLAN &amp; PROFILE STA. 0+00 TO STA. 10+00</p>			
DESIGNED: TJS	CAD FILE NAME: MN10P001.DWG		
DRAWN: RSC	DRAWING NUMBER: M34-CH-R-84/220		
CHECKED: TJS	SHEET 21		
SUBMITTED BY:	OF 119		
ED-8	DATE: 07-29-92		
ED-8H	SPEC NO:		





# VERTICAL CONTROL POINT

BM-#2 - EL. 716.88 TOP OF I.P.  
R/W MON. P-160

## NOTES:

- ELEVATIONS REFER TO M.S.L. (1928 ADJ.)
- COORDINATES AND GRID FOR PROJECT ARE LAMBERT GRID, MINNESOTA SOUTH ZONE.
- EXISTING TOPOGRAPHIC GROUND LINES MAY VARY FROM THOSE SHOWN ON PLANS.
- SIDE DITCH SLOPES VARY TO 8% MAX.
- FILL EXISTING EAST CREEK TO EL. 705.0 UPON COMPLETION OF EAST CREEK REALIGNMENT.
- PLACE 5" CLS AGGREGATE MATERIAL ON TOP OF LEVEE AFTER TRUCKS ARE DONE HAULING.
- PLACE SILT FENCE ALONG BOTH BANKS OF EAST CREEK REALIGNMENT, AS DIRECTED BY THE ENGINEER.
- PLACE SILT FENCE ALONG RIVERWARD SIDE OF LEVEE.

## REFERENCES:

	DWG NO.
1. GENERAL PLAN	10/201
2. LEVEE ALIGNMENT	84/218
3. AGGREGATE TRAIL TYPICAL	84/238
4. TEMPORARY EROSION CONTROL DETAILS	84/237
5. EAST CREEK ALIGNMENT	84/218
6. EAST CREEK PROFILE & SECTION	84/244
7. COURTHOUSE LAKE RECREATIONAL TRAIL	84/305

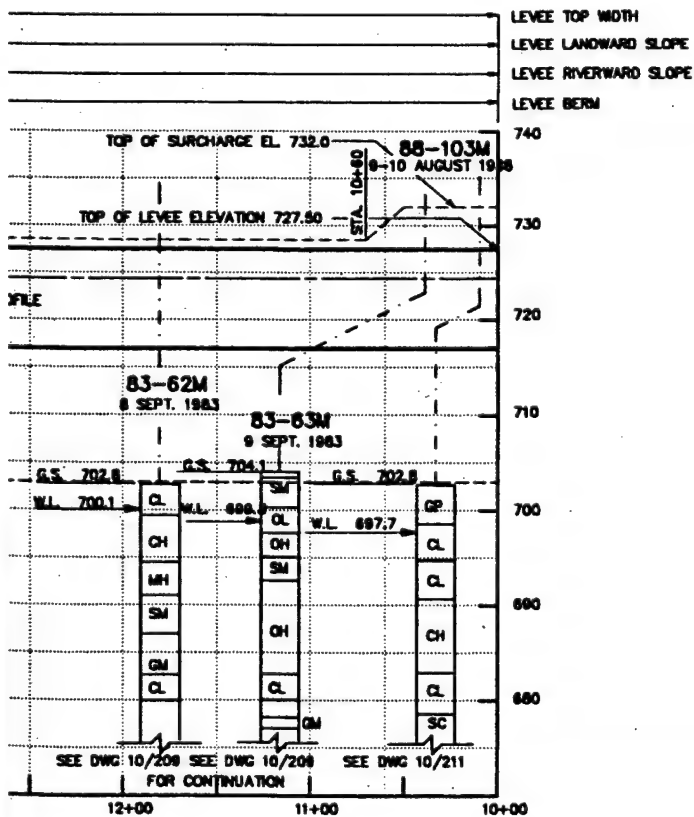

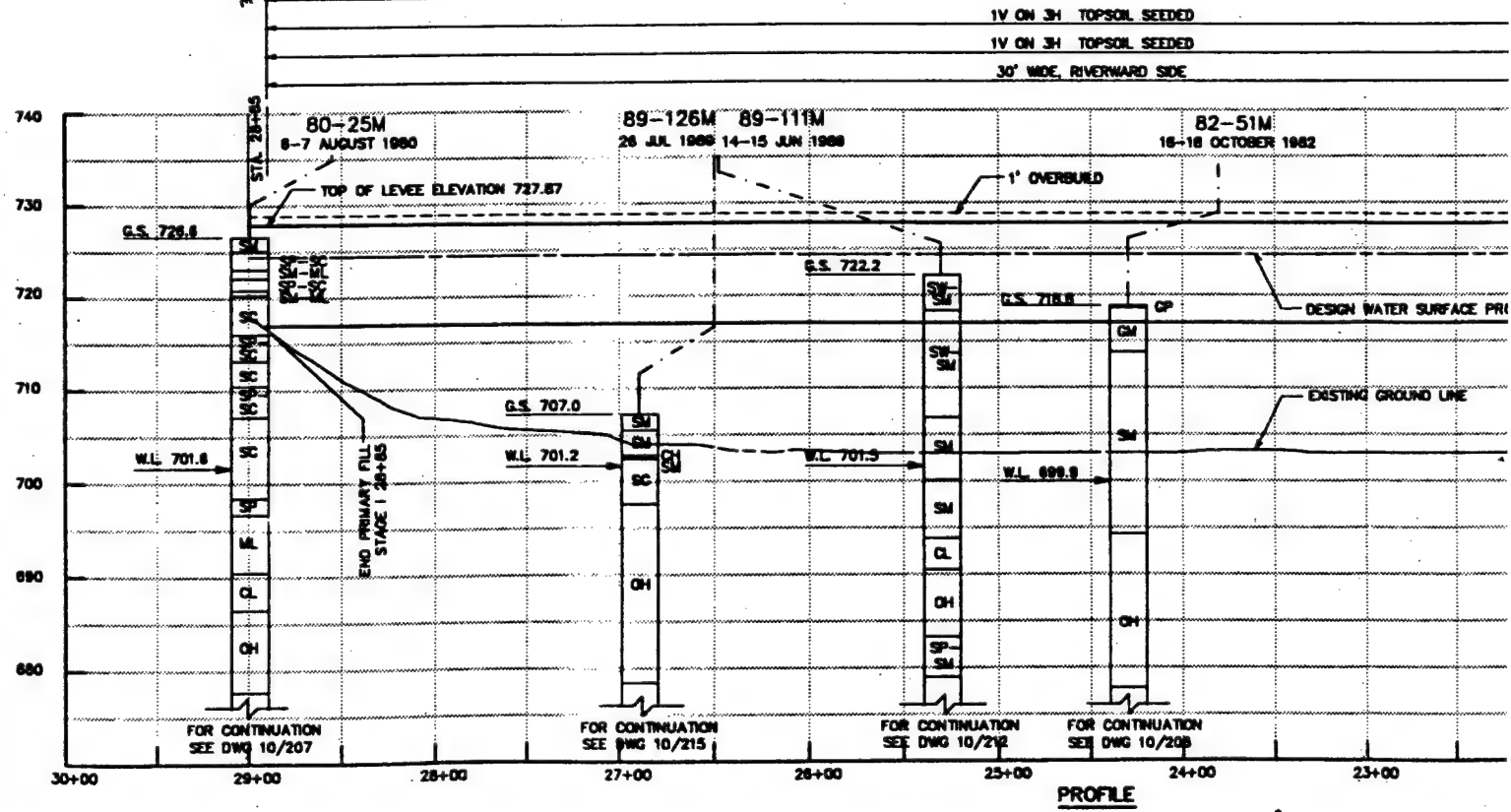
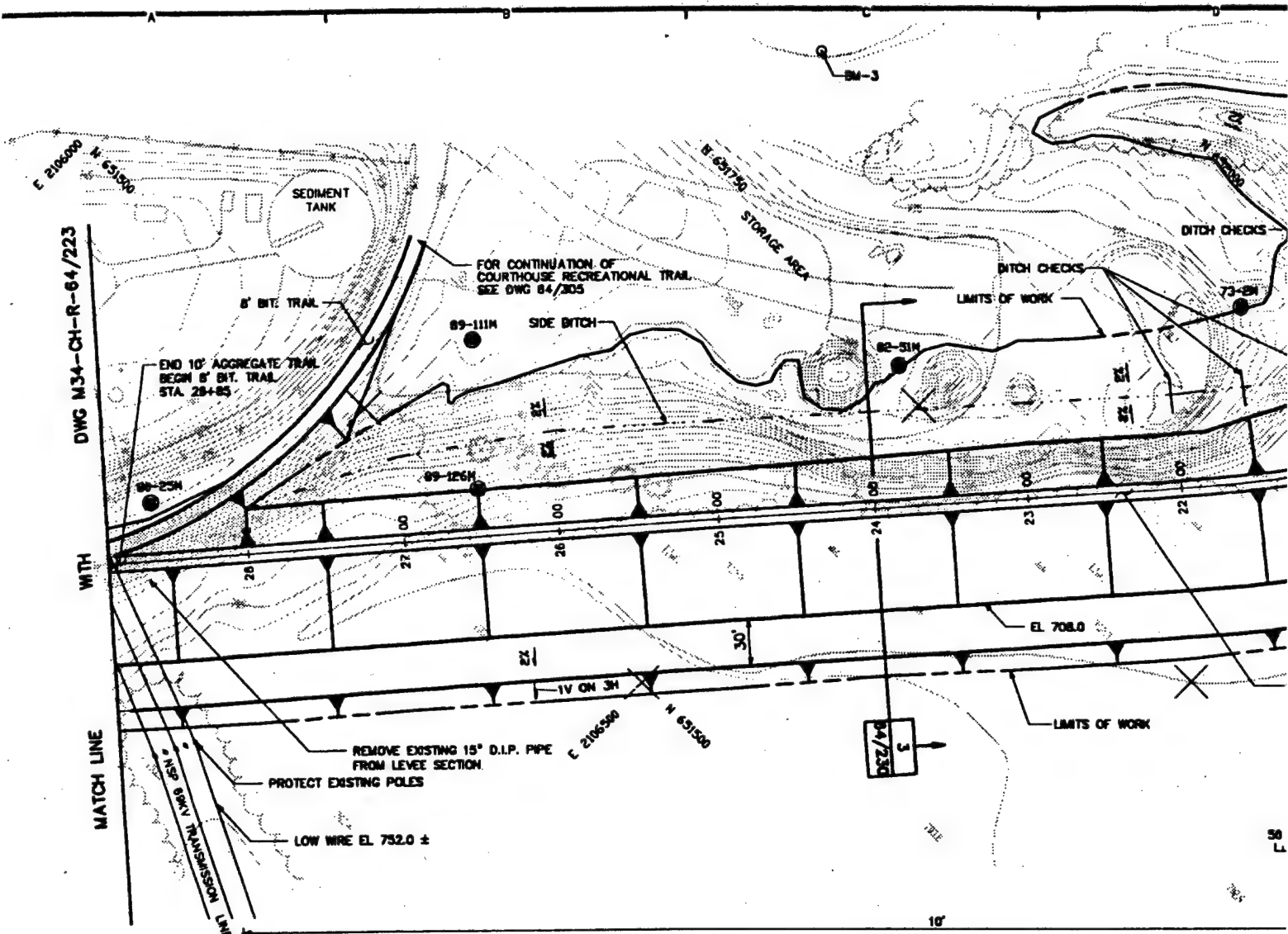


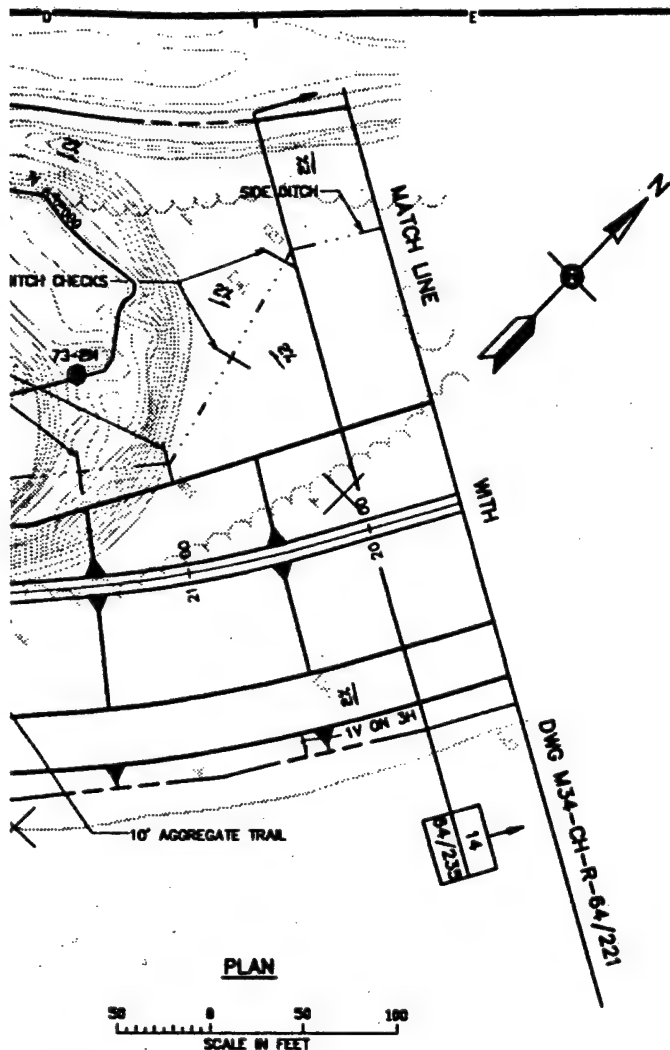
FIGURE 15

SYMBOL		DESCRIPTION		DATE	APPROVAL
		PLANNING TRANSPORTATION ENGINEERING URBAN DESIGN		DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA	
DESIGNED: TJS		FLOOD CONTROL - MINNESOTA RIVER CHASKA PROJECT CHASKA, MINNESOTA <b>CHASKA STAGE 4</b> DRAINAGE & LEVEES PLAN & PROFILE STA. 10+00 TO STA. 19+50			
DRAWING: RSC					
CHECKED: TJS					
SUBMITTED BY:					
ED-8		CAD FILE NAME: MN10P002.DWG		DRAWING NUMBER:	SHT 22
DATE: 07-29-92		SPEC NO:		M34-CH-R-64/221	OF 119



PROFILE





### VERTICAL CONTROL POINT

BM-#3 - EL. 714.18 TOP OF I.P.  
R/W MON. T-217

### NOTES:

1. ELEVATIONS REFER TO M.S.L. (1929 ADJ.)
2. COORDINATES AND GRID FOR PROJECT ARE LAMBERT GRID, MINNESOTA SOUTH ZONE.
3. EXISTING TOPOGRAPHIC GROUND LINES MAY VARY FROM THOSE SHOWN ON PLANS.
4. SIDE DITCH SLOPES VARY TO 6% MAX
5. PLACE 5" CLS AGGREGATE MATERIAL ON TOP OF LEVEE AFTER TRUCKS ARE DONE HAULING.
6. PLACE SILT FENCE ALONG RIVERWARD SIDE OF LEVEE.

### REFERENCES:

### DWG NO.

- |                                       |        |
|---------------------------------------|--------|
| 1. GENERAL PLAN                       | 10/201 |
| 2. LEVEE ALIGNMENT                    | 64/218 |
| 3. AGGREGATE TRAIL TYPICAL            | 64/238 |
| 4. BITUMINOUS TRAIL TYPICAL           | 64/238 |
| 5. TEMPORARY EROSION CONTROL DETAILS  | 64/237 |
| 6. COURTHOUSE LAKE RECREATIONAL TRAIL | 64/305 |

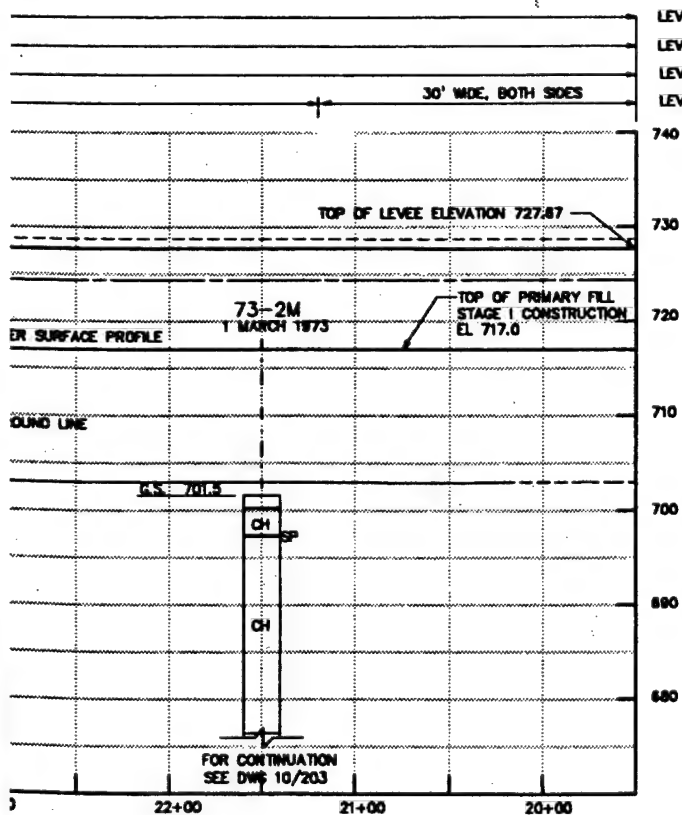
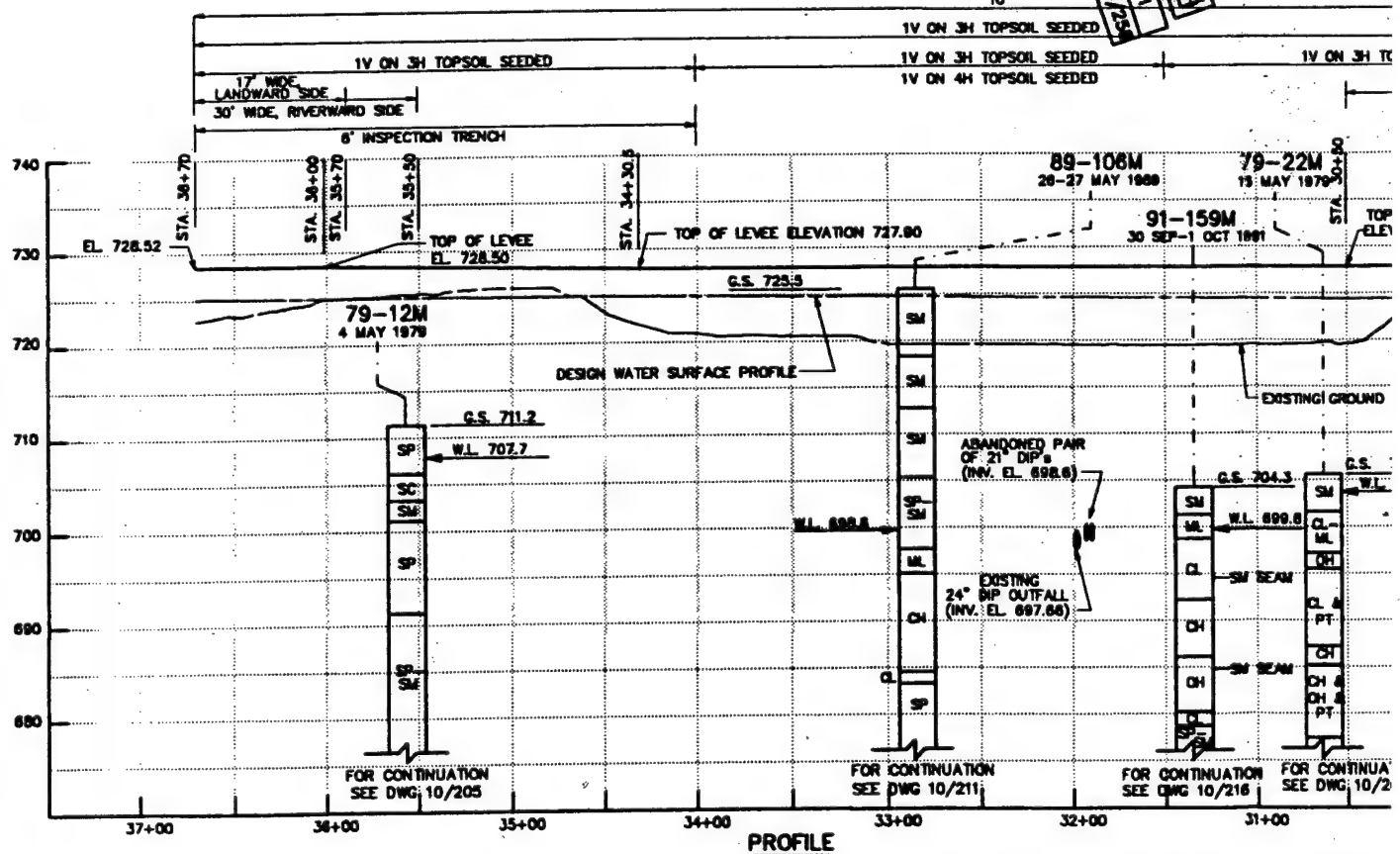
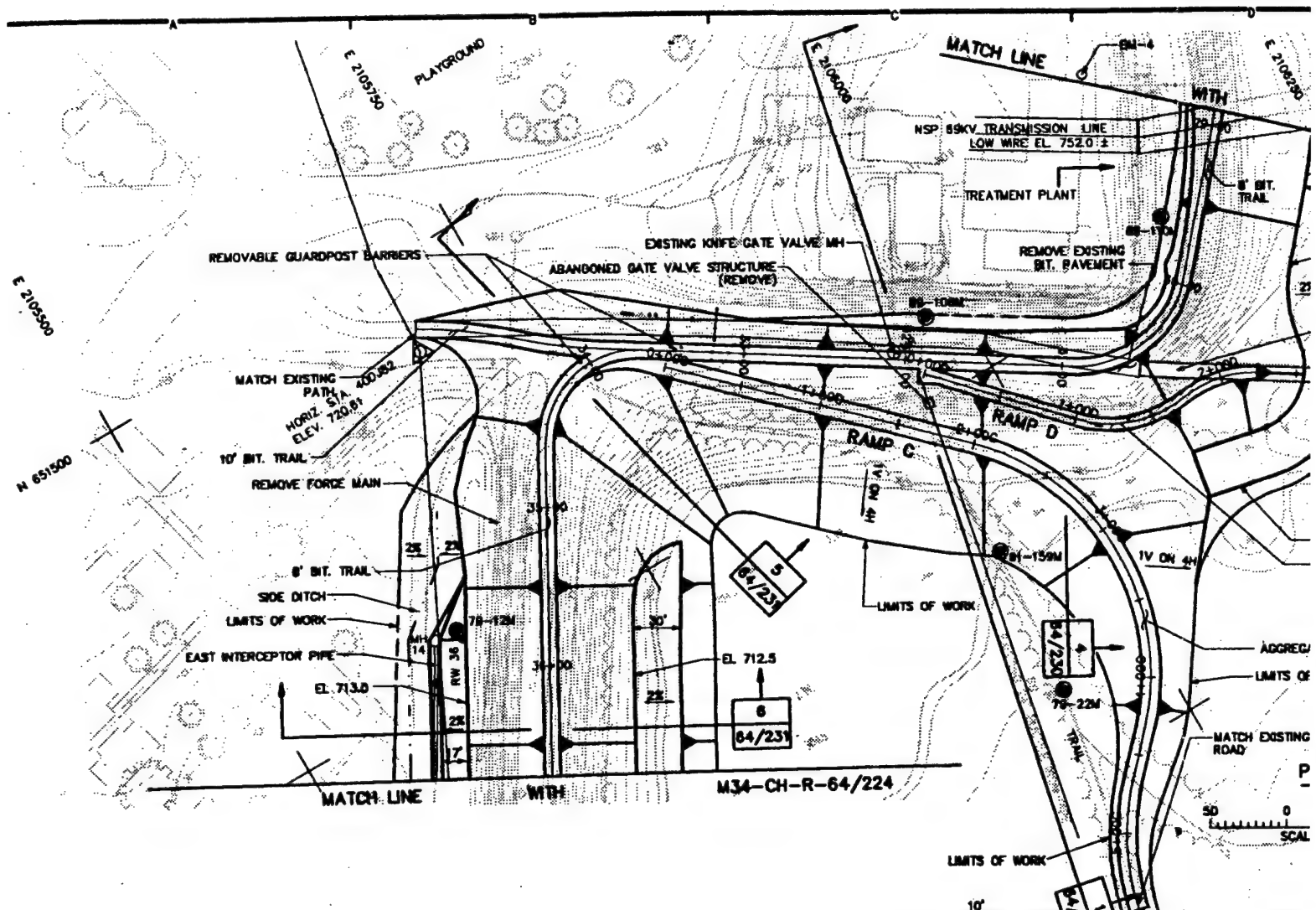


FIGURE 16

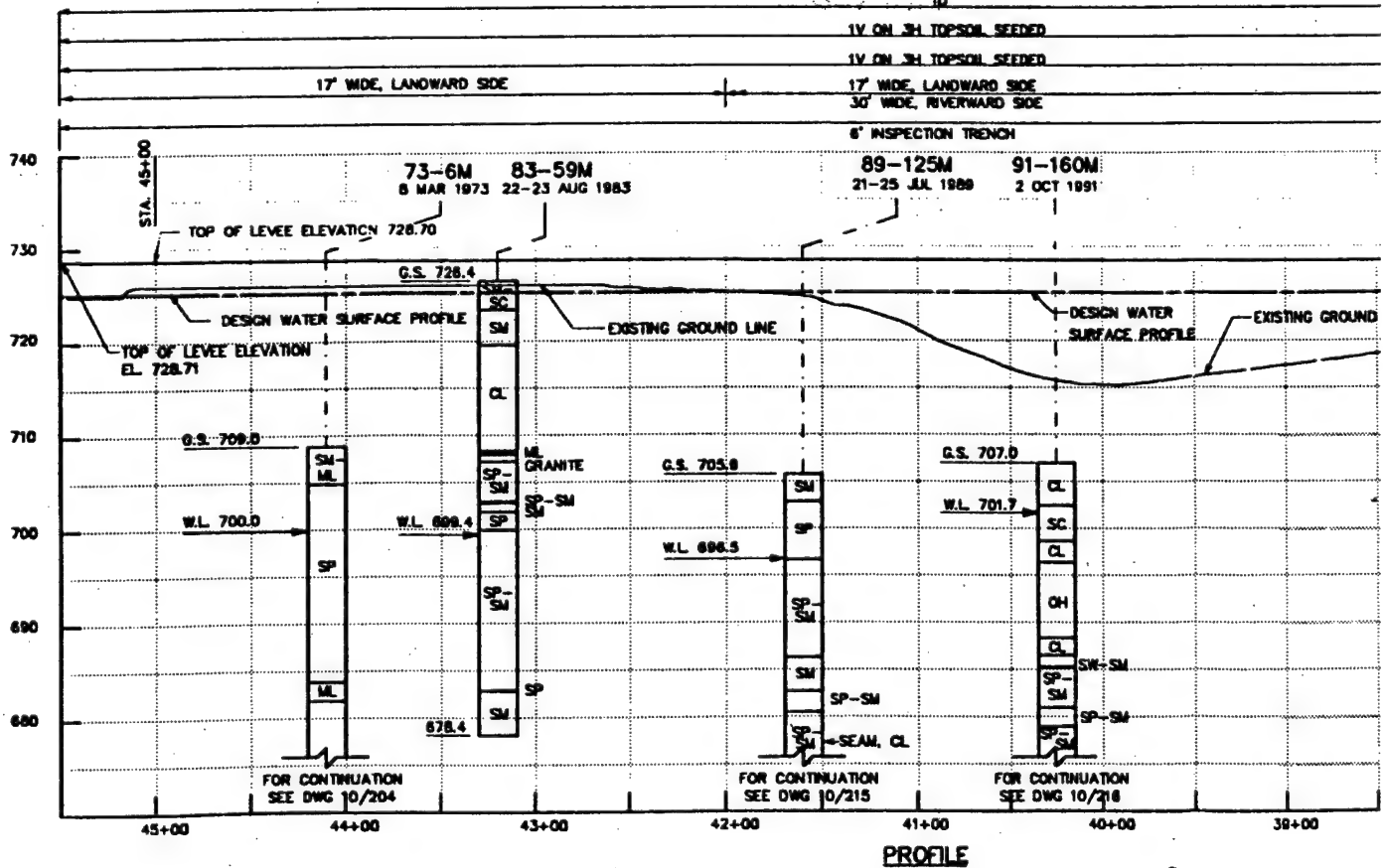
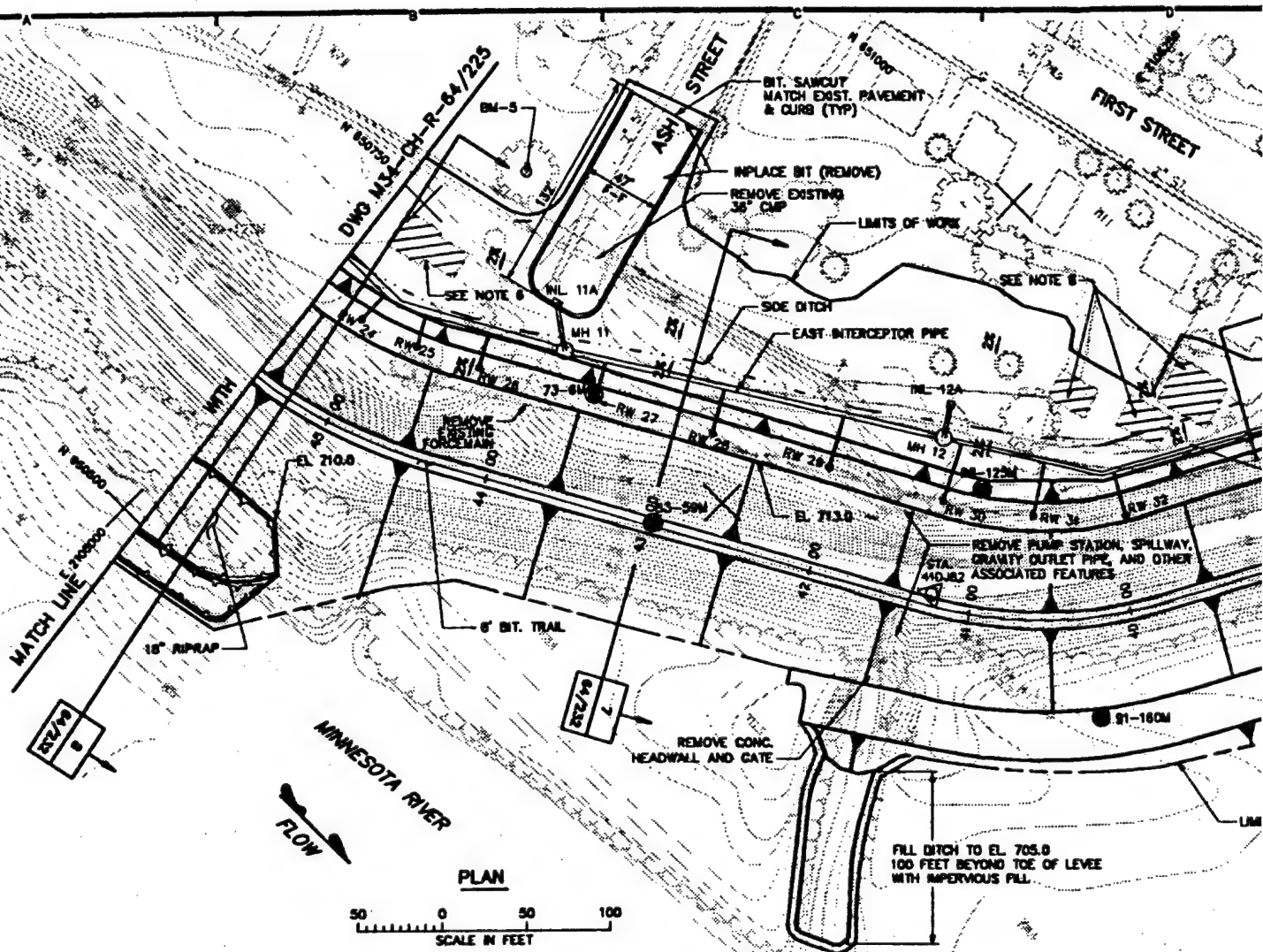
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>BRW</b>	PLANNING TRANSPORTATION ENGINEERING URBAN DESIGN		
<b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
DESIGNED: TJS DRAWN: RSC CHECKED: TJS SUBMITTED BY:			
FLOOD CONTROL - MINNESOTA RIVER CHASKA PROJECT CHASKA, MINNESOTA <b>CHASKA STAGE 4</b> DRAINAGE & LEVEES PLAN & PROFILE STA. 19+50 TO STA. 28+90			
ED-8	CAD FILE NAME: MN10P003.DWG	DRAWING NUMBER: M34-CH-R-64/222	SHT 23 OF 119
ED-SH	DATE: 07-29-92	SPEC NO.	

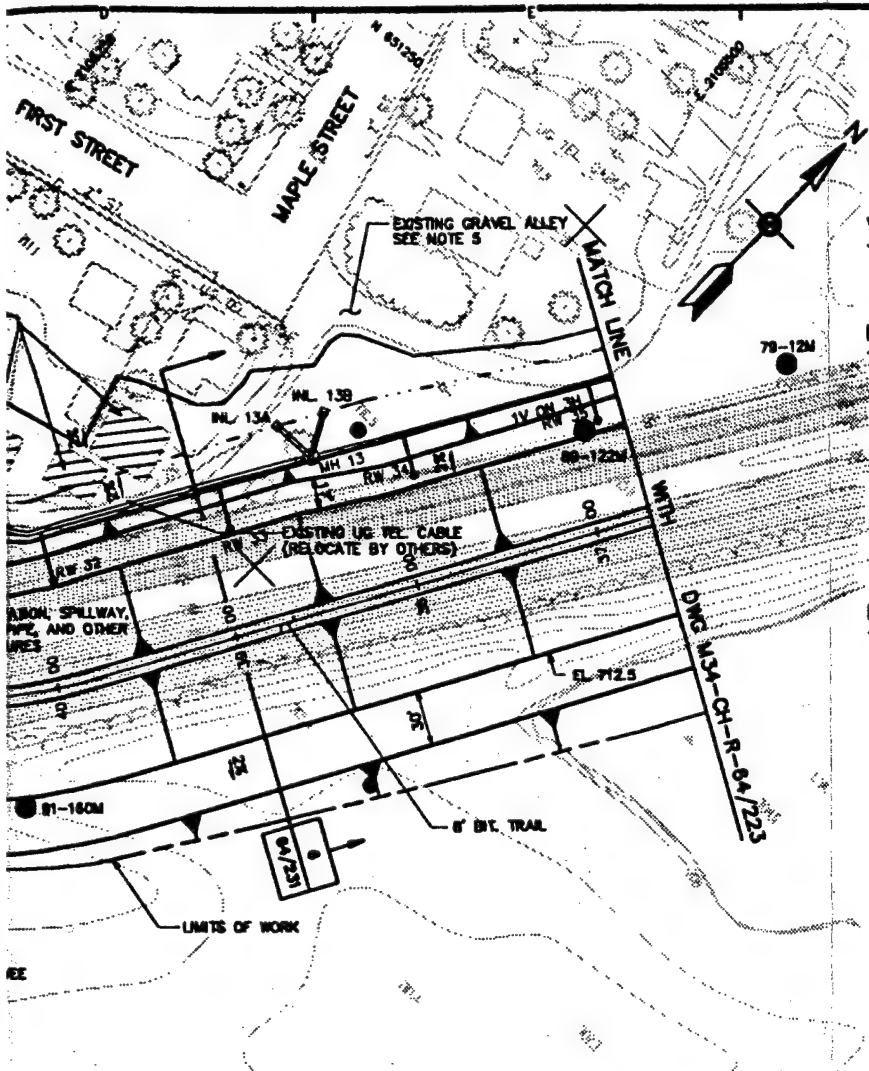
2











#### VERTICAL CONTROL POINT

BM-95 - EL. 710.83 2 NAILS IN SO  
FACE OF ASH SO END ASH ST.  
± 36' SE OF SE CORNER OF GARAGE

#### HORIZONTAL CONTROL POINT

STA. 410.82  
X=2,105,378.527  
Y=650,800.401

#### NOTES:

- ELEVATIONS REFER TO M.S.L. (1929 ADJ.)
- COORDINATES AND GRID FOR PROJECT ARE LAMBERT GRID, MINNESOTA SOUTH ZONE.
- EXISTING TOPOGRAPHIC GROUND LINES MAY VARY FROM THOSE SHOWN ON PLANS.
- SIDE DITCH SLOPES VARY TO 6% MAX.
- REPLACE 10' GRAVEL ALLEY WHERE DISTURBED STA. 37+00.
- BUILDINGS TO BE REMOVED BY OTHERS, CONTRACTOR SHALL REMOVE SLAB OR FOUNDATION AND BACKFILL WITH GRANULAR MATERIAL.
- CONSTRUCT SIDE DITCH ALONG LANDWARD OF LEVEE BERM TO DIRECT RUNOFF INTO INTERCEPTOR PIPE INLETS.
- EXISTING DISTRIBUTION POWER LINES, POLES, AND GUY WIRES TO BE RELOCATED BY CITY FORCES.
- ALL WATER MAIN, SANITARY SEWER AND FORCE MAINS BENEATH PROPOSED LEVEE SHALL BE REMOVED.
- PLACE SILT FENCE ALONG RIVERWARD SIDE OF LEVEE.
- PROPOSED CURB & GUTTER IN ASH TO HAVE OUTFALL CUTTER TO INLET 11A. FIELD VERIFY TOP OF CURB ELEVATIONS AND PROVIDE CURB CUTS TO ALLOW SIDE DITCH TO DRAIN INTO INLETS.

#### REFERENCES:

#### DWG NO.

- |                                      |        |
|--------------------------------------|--------|
| 1. GENERAL PLAN                      | 10/201 |
| 2. LEVEE ALIGNMENT                   | 84/218 |
| 3. EAST INTERCEPTOR PIPE             | 84/253 |
| 4. INLET SCHEDULE                    | 84/252 |
| 5. RELIEF WELL                       | 84/254 |
| 6. TEMPORARY EROSION CONTROL DETAILS | 84/237 |

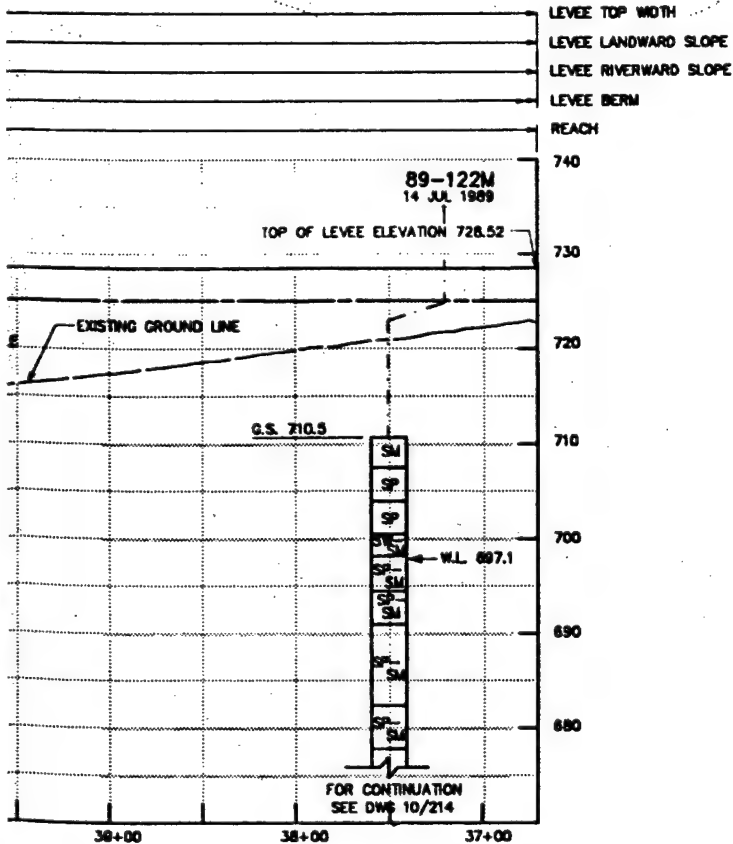

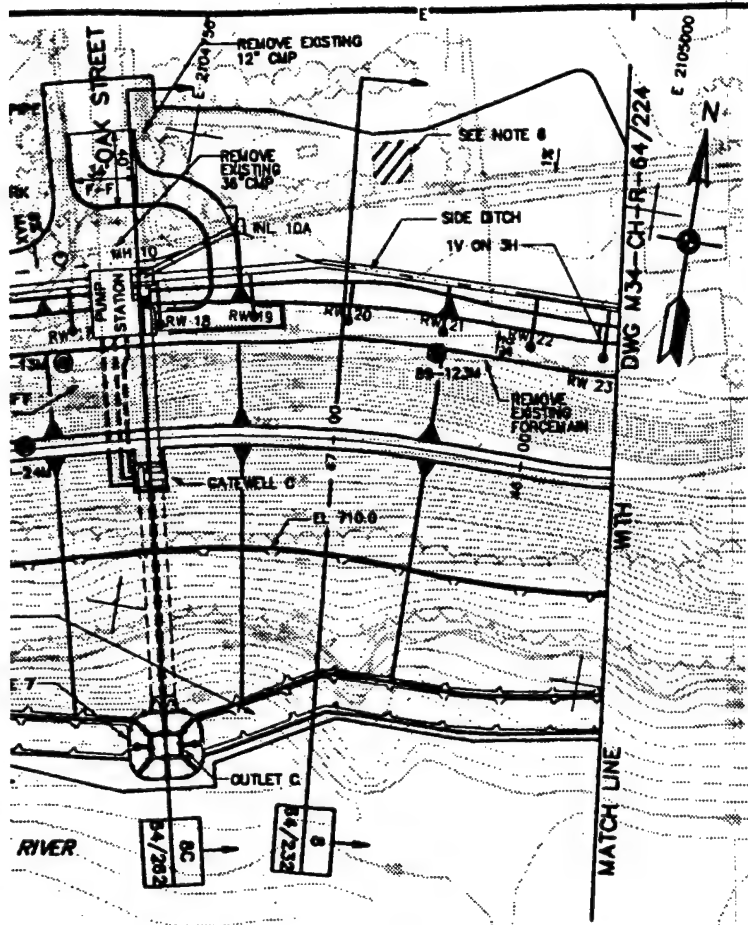


FIGURE 18

SYMBOL	DESCRIPTION	DATE	APPROV.
 <b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
DESIGNED: TJS DRAWN: RSC CHECKED: TJS SUBMITTED BY: ED-8 ED-6H		FLOOD CONTROL - MINNESOTA RIVER CHASKA PROJECT CHASKA, MINNESOTA <b>CHASKA STAGE 4</b> DRAINAGE & LEVEES PLAN & PROFILE STA. 36+70 TO STA. 45+50	
CAD FILE NAME: MN10P005.DWG DATE: 07-29-92		DRAWING NUMBER: <b>M34-CH-R-64/224</b> SHEET 25 OF 119	





### VERTICAL CONTROL POINT

BM-95 - EL. 728.22 (M.S.L. 1929 ADJ.)  
STD. 3" BRASS DISC ON TOP OF S.E.  
WINGWALL OF BR# 9010 TH 41  
OVER MINNESOTA RIVER.

### HORIZONTAL CONTROL POINT

STA. 42+82  
E 2,104,028.763  
N 850,372.857

### NOTES:

- ELEVATIONS REFER TO M.S.L. (1929 ADJ.)
- COORDINATES AND GRID FOR PROJECT ARE LAMBERT GRID, MINNESOTA SOUTH ZONE.
- EXISTING TOPOGRAPHIC GROUND LINES MAY VARY FROM THOSE SHOWN ON PLANS.
- SIDE DITCH SLOPES VARY TO 6% MAX.
- REMOVE EXISTING LIFT STATION, GATE VALVE MH, AND ALL MISC. ITEMS.
- BUILDINGS TO BE REMOVED BY OTHERS, CONTRACTOR SHALL REMOVE SLAB OR FOUNDATION AND BACKFILL WITH GRANULAR MATERIAL.
- FOR APPROXIMATE LIMITS OF SHEET PILING SEE DRAWING 64/271
- CONSTRUCT SIDE DITCH ALONG LANDWARD OF LEVEE BERM TO DIRECT RUNOFF INTO INTERCEPTOR PIPE INLETS.
- EXISTING DISTRIBUTION POWER LINES, POLES, AND GUY WIRES TO BE RELOCATED BY CITY FORCES.
- ALL WATER MAIN, SANITARY SEWER AND FORCE MAINS BENEATH PROPOSED LEVEE SHALL BE REMOVED.
- BEGIN SAFETY RAILING STA. 0+308, SEE LANDSCAPE DRAWINGS.
- PROPOSED CURB ELEVATIONS TO BE VERIFIED IN FIELD TO ALLOW WATER FROM SIDE DITCH TO DRAIN INTO INLETS. TOP OF GRATE ELEVATIONS ESTABLISHED IN INLET CHART ON SHEET 64/252 CONTROLS.
- PROPOSED CURB & GUTTER IN ASH TO HAVE OUTFALL GUTTER TO INLET 11A. FIELD VERIFY TOP OF CURB ELEVATIONS AND PROVIDE CURB CUTS TO ALLOW SIDE DITCH TO DRAIN INTO INLETS.

### REFERENCES:

### DWG NO.

- |   |        |
|---|--------|
| 1. GENERAL PLAN                         | 10/201 |
| 2. LEVEE ALIGNMENT                      | 64/218 |
| 3. EAST INTERCEPTOR                     | 64/255 |
| 4. WEST INTERCEPTOR                     | 64/258 |
| 5. INLET SCHEDULE                       | 64/252 |
| 6. TRAIL ALIGNMENT (RAMP-B)             | 64/219 |
| 7. RELIEF WELL                          | 64/254 |
| 8. PUMP STATION                         | 64/278 |
| 9. GATEWELL C                           | 64/283 |
| 10. OUTLET C                            | 64/282 |
| 11. TRAIL PROFILE & SECTION             | 64/240 |
| 12. TEMPORARY EROSION CONTROL DETAILS   | 64/237 |
| 13. INTERLOCKING CONCRETE MODULAR UNITS | 64/238 |

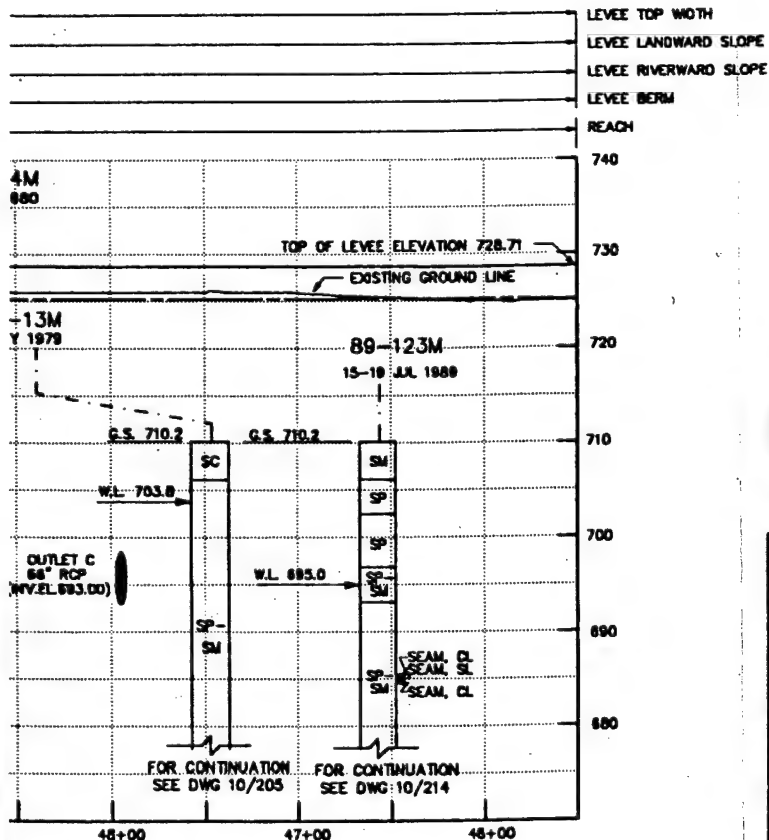
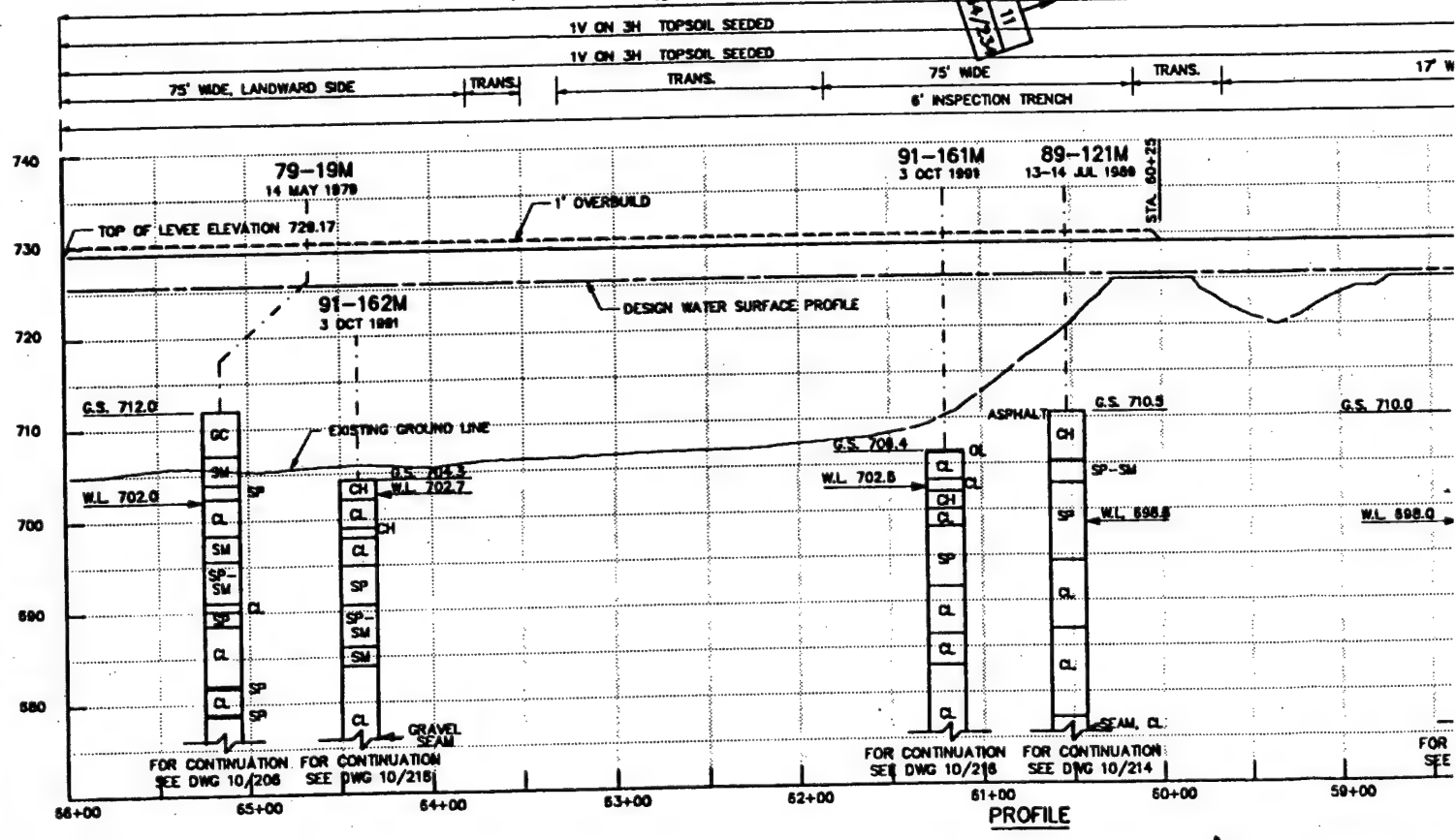
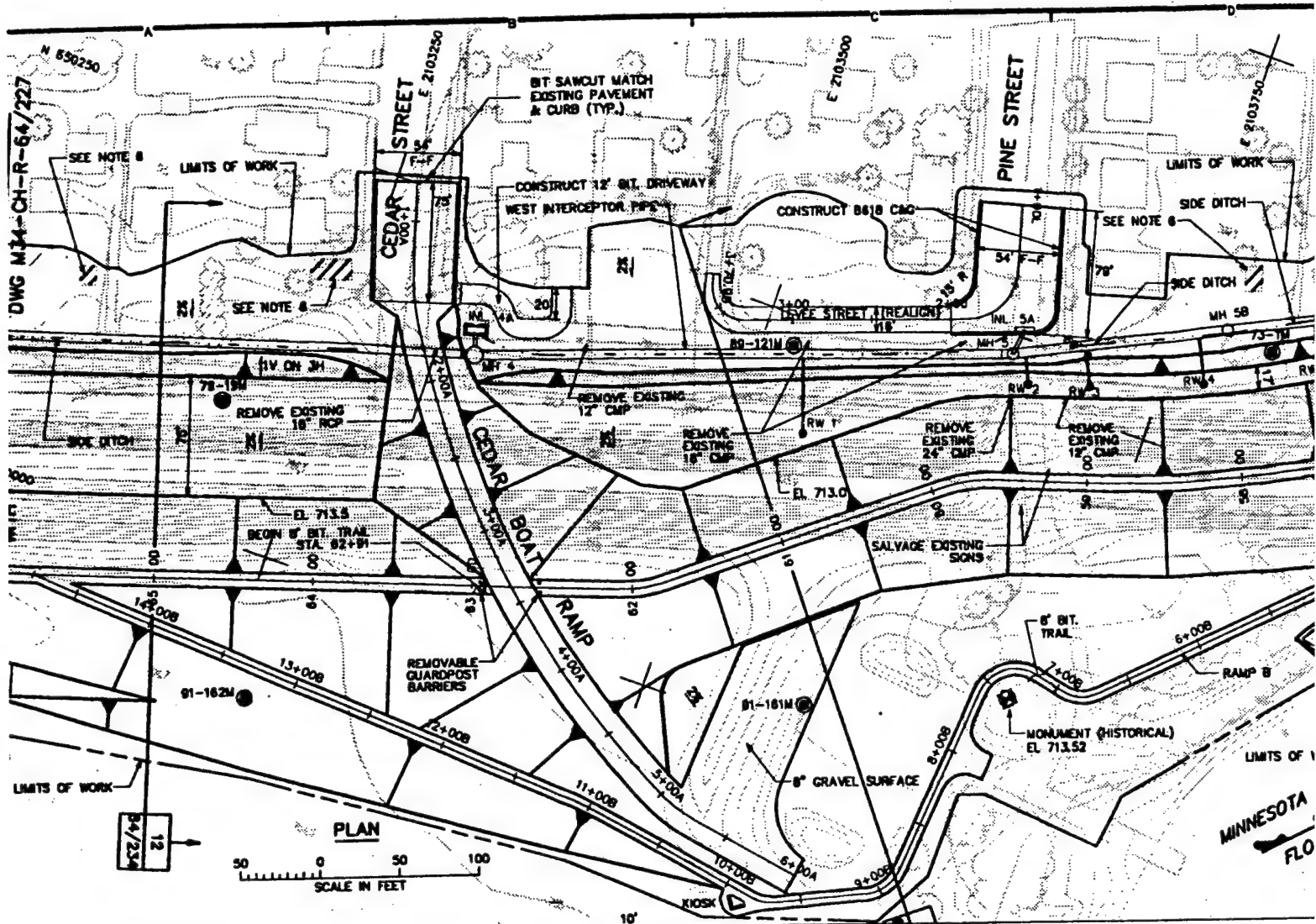
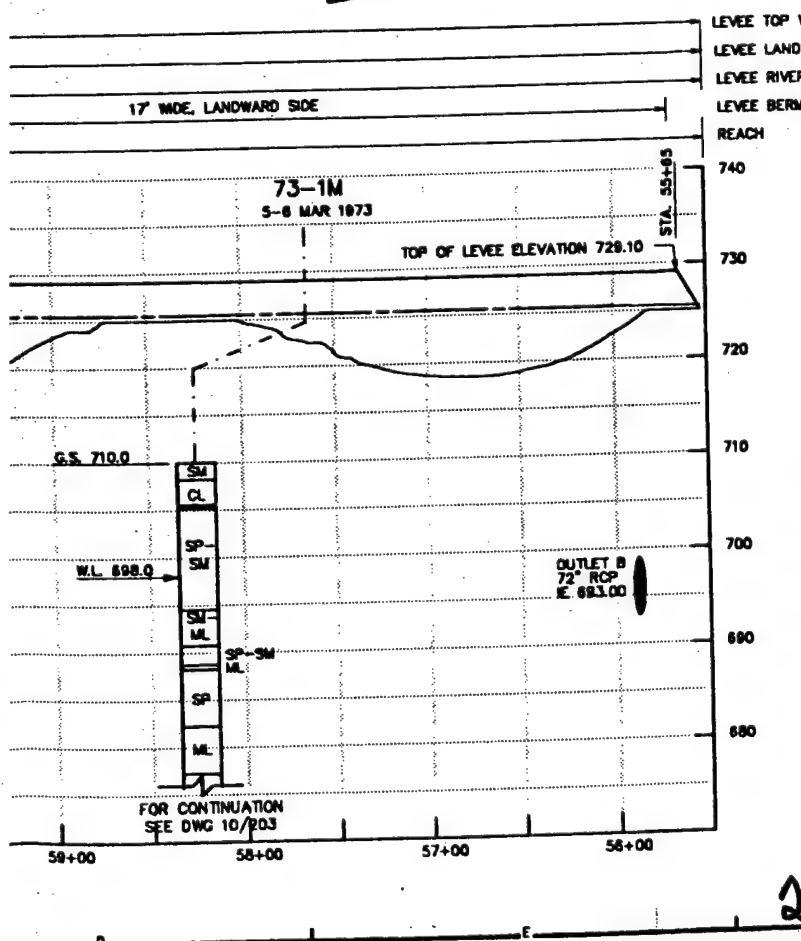
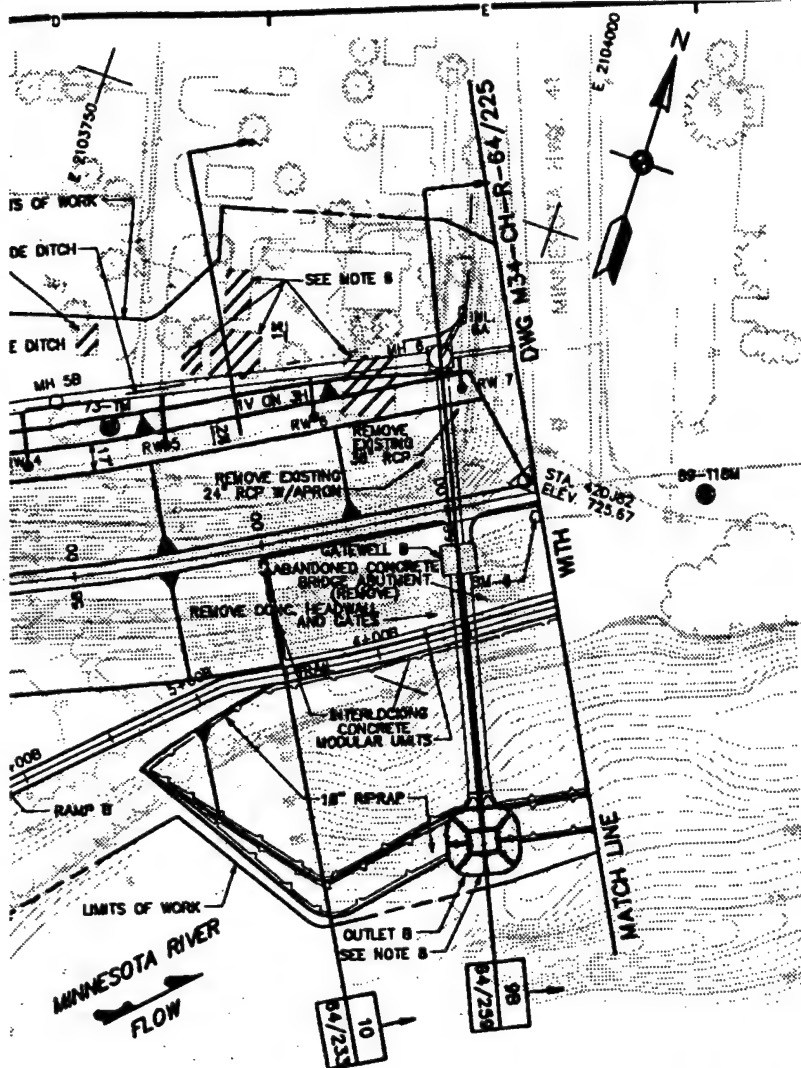


Figure 19

SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>DEPARTMENT OF THE ARMY</b> <b>ST. PAUL DISTRICT, CORPS OF ENGINEERS</b> <b>ST. PAUL, MINNESOTA</b>			
<b>FLOOD CONTROL - MINNESOTA RIVER</b> <b>CHASKA PROJECT CHASKA, MINNESOTA</b> <b>CHASKA STAGE 4</b> <b>DRAINAGE &amp; LEVEES</b> <b>PLAN &amp; PROFILE</b> <b>STA. 45+50 TO STA. 55+50</b>			
DESIGNED: TJS	DRAWING NUMBER: M34-CH-R-64/225		
DRAWN: RSC	SHEET 26		
CHECKED: TJS	DATE: 07-29-92		
SUBMITTED BY:	SPEC NO:		
ED-0	DRAWING NUMBER: M34-CH-R-64/225		
ED-0H	SHEET 26		
DATE: 07-29-92	SPEC NO:		







# VERTICAL CONTROL POINT

BM-95 - EL. 726.22 (M.S.L. 1929 ADJ.)  
 STD. 3" BRASS DISC ON TOP OF S.E.  
 WINGWALL OF BR# 9010 TH 41  
 OVER MINNESOTA RIVER.

# HORIZONTAL CONTROL POINT

STA. 420.82  
 E 2,104,028.763  
 N 850,372.857

# NOTES:

- ELEVATIONS REFER TO M.S.L. (1929 ADJ.)
- COORDINATES AND GRID FOR PROJECT ARE LAMBERT GRID, MINNESOTA SOUTH ZONE.
- EXISTING TOPOGRAPHIC GROUND LINES MAY VARY FROM THOSE SHOWN ON PLANS.
- SIDE DITCH SLOPES VARY TO 6% MAX.
- PLACE REMOVABLE GUARDPOST BARRIERS AT STA. 62+57 AND STA. 62+92
- BUILDINGS TO BE REMOVED BY OTHERS. CONTRACTOR SHALL REMOVE SLAB OR FOUNDATION AND BACKFILL WITH GRANULAR MATERIAL.
- CONSTRUCT SIDE DITCH ALONG LANDWARD OF LEVEE BERM TO DIRECT RUNOFF INTO INTERCEPTOR PIPE INLETS.
- FOR APPROXIMATE LIMITS OF SHEET PILING SEE DRAWING 64/272
- EXISTING DISTRIBUTION POWER LINES, POLES, AND GUY WIRES TO BE RELOCATED BY CITY FORCES.
- ALL WATER MAIN, SANITARY SEWER AND FORCE MAINS BENEATH PROPOSED LEVEE SHALL BE REMOVED.
- END SAFETY RAILING STA. 4+328. SEE LANDSCAPE DRAWINGS.
- PROPOSED CURB ELEVATIONS TO BE VERIFIED IN FIELD TO ALLOW WATER FROM SIDE DITCH TO DRAIN INTO INLETS. TOP OF GRATE ELEVATIONS ESTABLISHED IN INLET CHART ON SHEET 64/252 CONTROLS.
- PROPOSED CURB & GUTTER IN ASH TO HAVE OUTFALL GUTTER TO INLET 11A. FIELD VERIFY SIDE OF CURB ELEVATIONS AND PROVIDE CURB CUTS TO ALLOW SIDE DITCH TO DRAIN INTO INLETS.

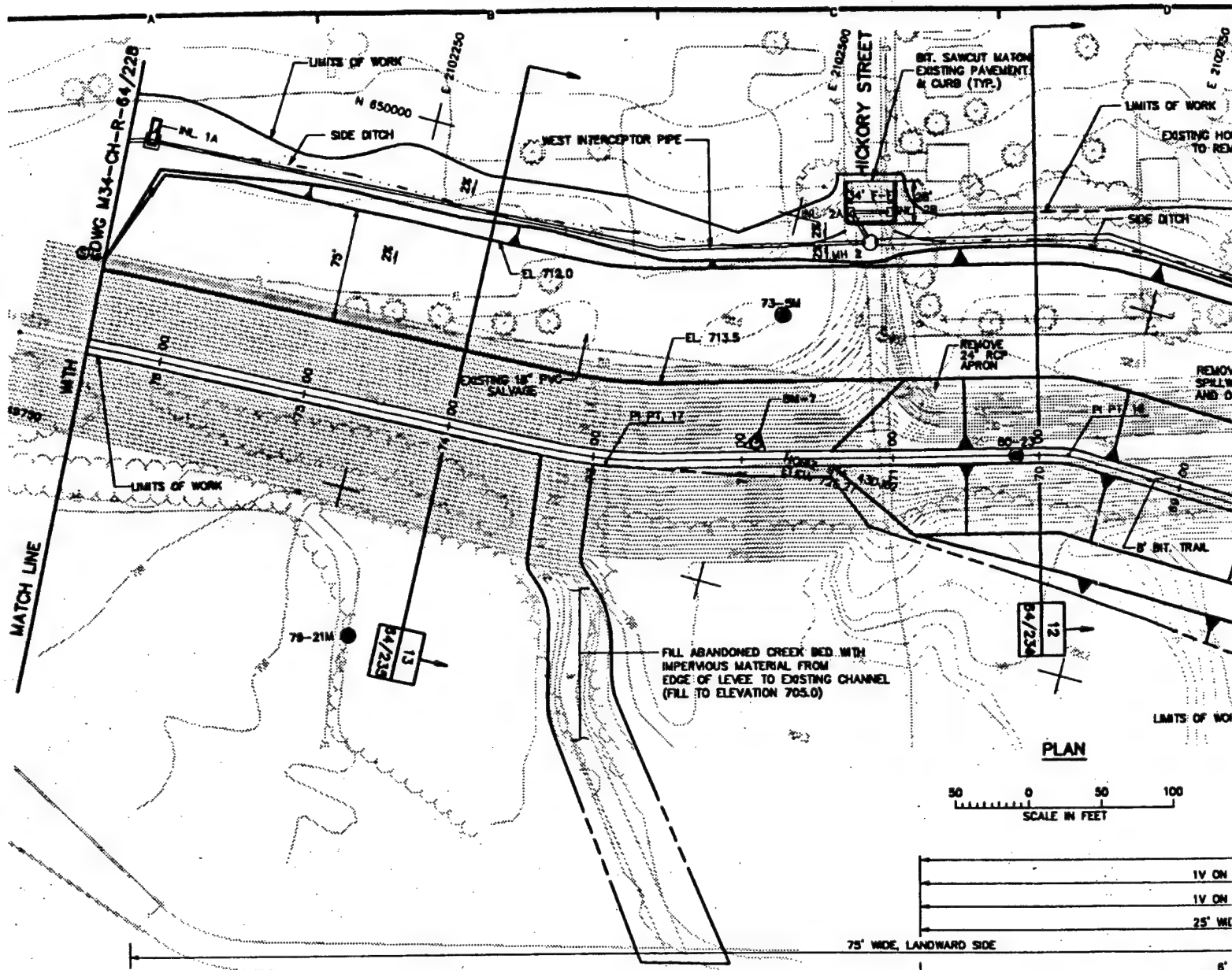
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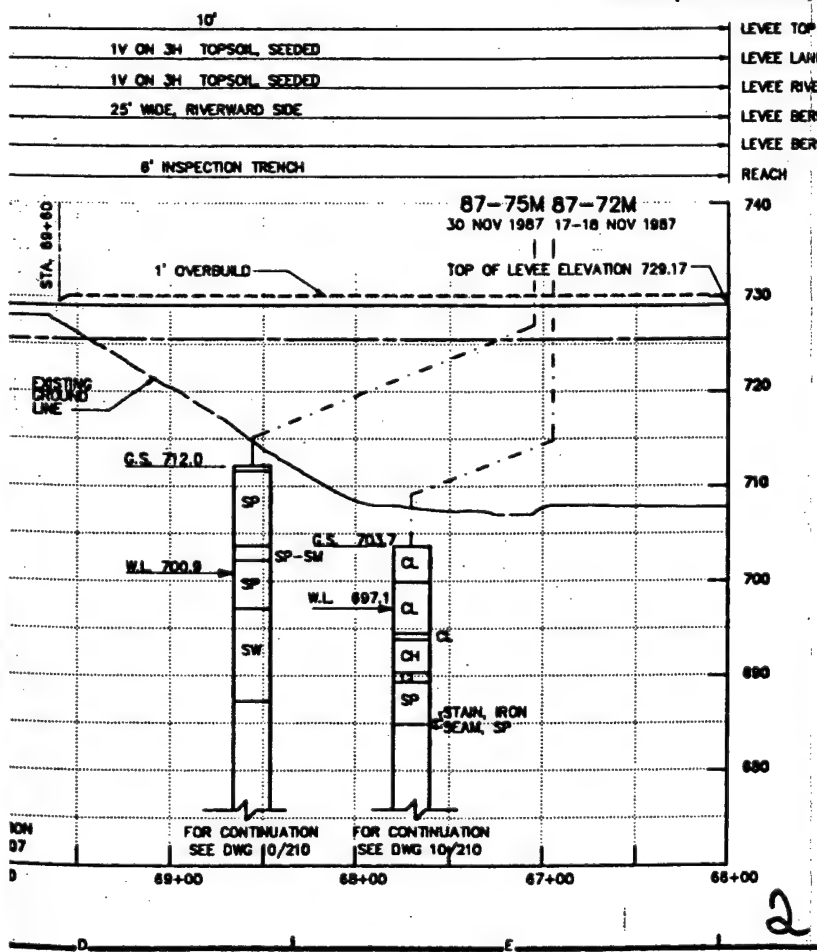
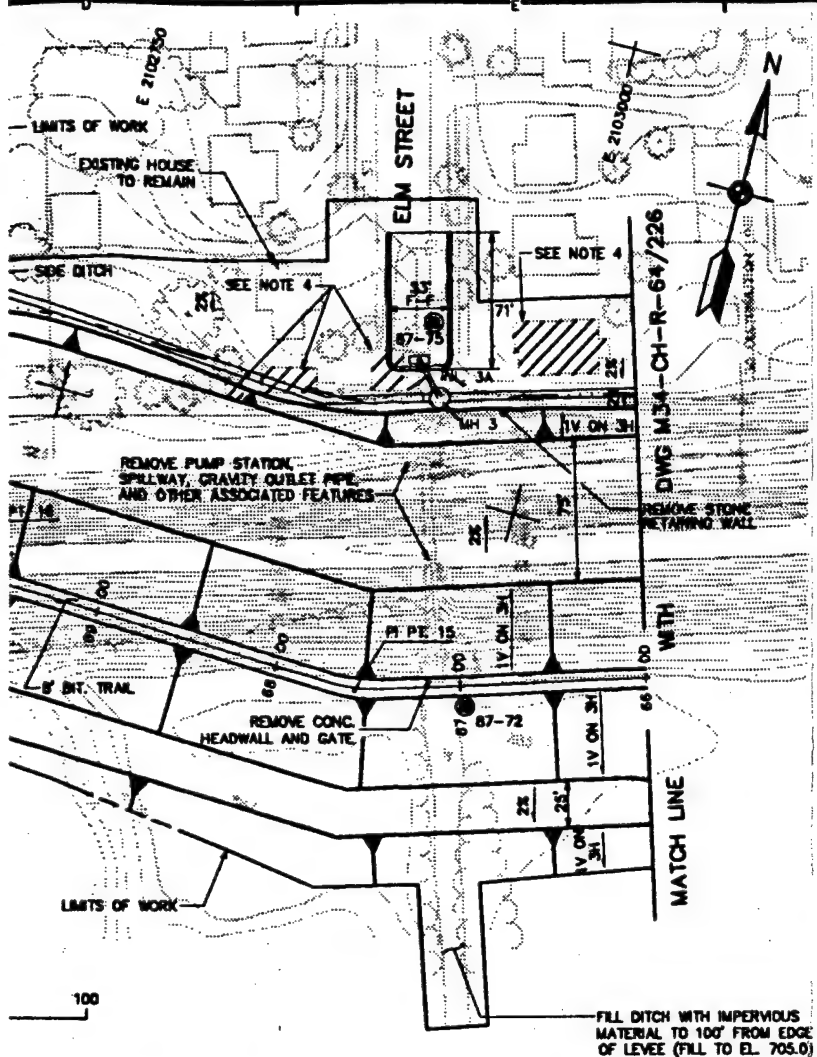
	DWG NO.
1. GENERAL PLAN	10/201
2. LEVEE ALIGNMENT	64/218
3. WEST INTERCEPTOR	64/256
4. INLET SCHEDULE	64/252
5. CEDAR BOAT RAMP ALIGNMENT (RAMP A)	64/219
6. TRAIL ALIGNMENT (RAMP B)	64/219
7. RELIEF WELL	64/254
8. OUTLET B	64/258
9. GATEWELL B	64/260
10. REMOVABLE GUARDPOST BARRIERS	64/307
11. LEVEE STREET ALIGNMENT	64/218
12. TRAIL PROFILE & SECTION (RAMP B)	64/240
13. CEDAR BOAT RAMP PROFILE & SECTION (RAMP A)	64/238
14. LEVEE STREET PROFILE & SECTION	64/245
15. TEMPORARY EROSION CONTROL DETAILS	64/237
16. INTERLOCKING CONCRETE MODULAR UNITS	64/238
17. KIOSK/BENCH DETAILS	64/308



FIGURE 20

SYMBOL		DESCRIPTION		DATE	APPROVAL
		PLANNING TRANSPORTATION ENGINEERING URBAN DESIGN		DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA	
DESIGNED: TJS DRAWN: RSC CHECKED: TJS SUBMITTED BY:		FLOOD CONTROL - MINNESOTA RIVER CHASKA PROJECT CHASKA STAGE 4 DRAINAGE & LEVEES PLAN & PROFILE STA. 55+50 TO STA. 65+00			
ED-0 ED-GH DATE: 07-29-92		CAD FILE NAME: MNTOP007.DWG SPEC NO:		DRAWING NUMBER: M34-CH-R-64/226 SH 27 OF 119	





### VERTICAL CONTROL POINT

BM-#7 - EL. 725.27 TOP 1 3/4" CAP  
STAMPED 430.82 WEST OF HICKORY  
NEAR TOP OF LEVEE

### HORIZONTAL CONTROL POINT

STA. 430.82  
E 2,102,512.420  
N 848,848.248

### NOTES:

1. ELEVATIONS REFER TO M.S.L. (1929 ADJ.)
2. COORDINATES AND GRID FOR PROJECT ARE LAMBERT GRID, MINNESOTA SOUTH ZONE.
3. EXISTING TOPOGRAPHIC GROUND LINES MAY VARY FROM THOSE SHOWN ON PLANS.
4. BUILDINGS TO BE REMOVED BY OTHERS. CONTRACTOR SHALL REMOVE SLAB OR FOUNDATION AND BACKFILL WITH GRANULAR MATERIAL.
5. SIDE DITCH SLOPES VARY TO 6% MAX.
6. CONSTRUCT SIDE DITCH ALONG LANDWARD SIDE OF LEVEE BERM TO DIRECT RUNOFF INTO INTERCEPTOR PIPE INLETS.
7. EXISTING DISTRIBUTION POWER LINES, POLES, AND GUY WIRES TO BE RELOCATED BY CITY FORCES.
8. ALL WATER MAIN, SANITARY SEWER AND FORCE MAINS BENEATH PROPOSED LEVEE SHALL BE REMOVED.
9. SALVAGE EXISTING GUARDPOSTS AT STA. 71+70, AND RELOCATE.
10. EXISTING 10' AGGREGATE TRAIL ON LEVEE, STA. 71+20 TO STA. 83+20, TO REMAIN.
11. REMOVE STONE RETAINING WALL STA. 68+75 TO STA. 68+20
12. PROPOSED CURB ELEVATIONS TO BE VERIFIED IN FIELD TO ALLOW WATER FROM SIDE DITCH TO DRAIN INTO INLETS. TOP OF GRATE ELEVATIONS ESTABLISHED IN INLET CHART ON SHEET 64/252 CONTROLS.
13. PROPOSED CURB & GUTTER IN ASH TO HAVE OUTFALL GUTTER TO INLET 11A. FIELD VERIFY TOP OF CURB ELEVATIONS AND PROVIDE CURB CUTS TO ALLOW SIDE DITCH TO DRAIN INTO INLETS.

### REFERENCES:

	DWG NO.
1. GENERAL PLAN	10/201
2. LEVEE ALIGNMENT	64/218
3. WEST INTERCEPTOR	64/258
4. INLET SCHEDULE	64/252
5. TEMPORARY EROSION CONTROL DETAILS	64/237



FIGURE 21

SYMBOL		DESCRIPTION		DATE	APPROVAL
		PLANNING TRANSPORTATION ENGINEERING URBAN DESIGN		DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA	
DESIGNED: TJS DRAWN: RSC CHECKED: TJS SUBMITTED BY:		FLOOD CONTROL - MINNESOTA RIVER CHASKA PROJECT CHASKA, MINNESOTA <b>CHASKA STAGE 4</b> DRAINAGE & LEVEES PLAN & PROFILE STA. 68+00 TO STA. 76+50			
ED-8 ED-6H		CAD FILE NAME: MN10P008.DWG SPEC NO:		SHEET 28 OF 119	
DATE: 07-29-92		DRAWING NUMBER: M34-CH-R-64/227			





# VERTICAL CONTROL POINT

BM-#8 - EL. 721.52 TOP NUT HYDRANT  
ON SO SIDE 1ST STREET  
AT HOUSE NO. 837

## NOTES:

- ELEVATIONS REFER TO M.S.L. (1929 ADJ.)
- COORDINATES AND GRID FOR PROJECT ARE LAMBERT GRID, MINNESOTA SOUTH ZONE.
- EXISTING TOPOGRAPHIC GROUND LINES MAY VARY FROM THOSE SHOWN ON PLANS.
- CONTINUE 8" BIT TRAIL ON EXISTING LEVEE (STAGE 2) TO MATCH EXISTING CONCRETE SIDEWALK SOUTH SIDE OF FIRST STREET.
- REMOVE & REPLACE EXISTING GUARD POSTS AT STA. 83+15.
- PLACE 8" BIT. TRAIL ON LEVEE AFTER TRUCKS ARE DONE HAULING.
- CONTRACTOR TO REGRADE OR ADD CL.5 100% CRUSHED ON TOP OF STAGE 2 LEVEE AS NECESSARY TO BRING BACK TO GRADE AFTER HAULING AND PRIOR TO PAVING.

## REFERENCES:

	DWG NO.
1. GENERAL PLAN	10/201
2. LEVEE ALIGNMENT	84/218
3. WEST INTERCEPTOR	84/258
4. TEMPORARY EROSION CONTROL DETAILS	84/237
5. BITUMINOUS TRAIL TYPICAL	84/238

## DWG NO.

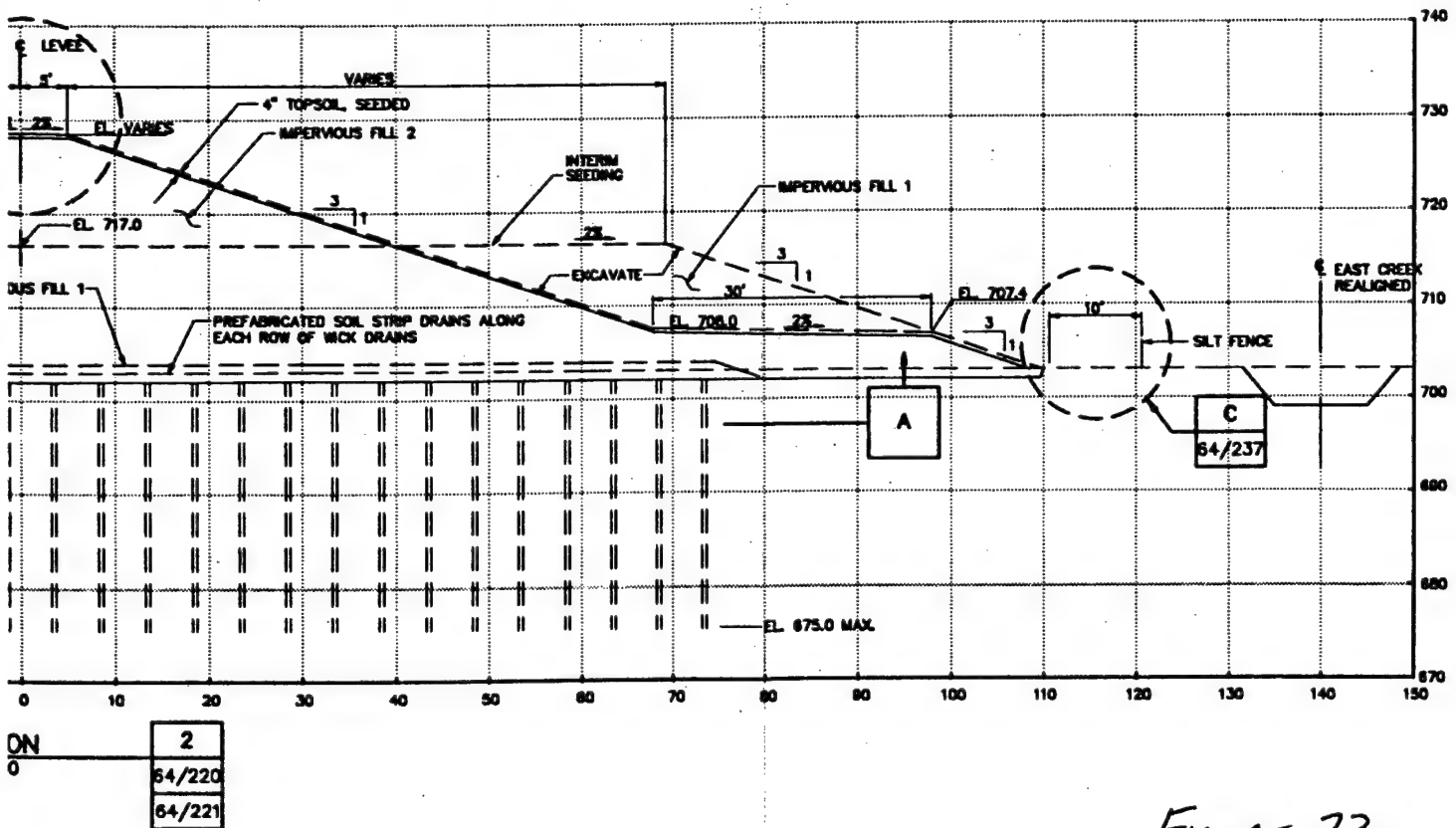
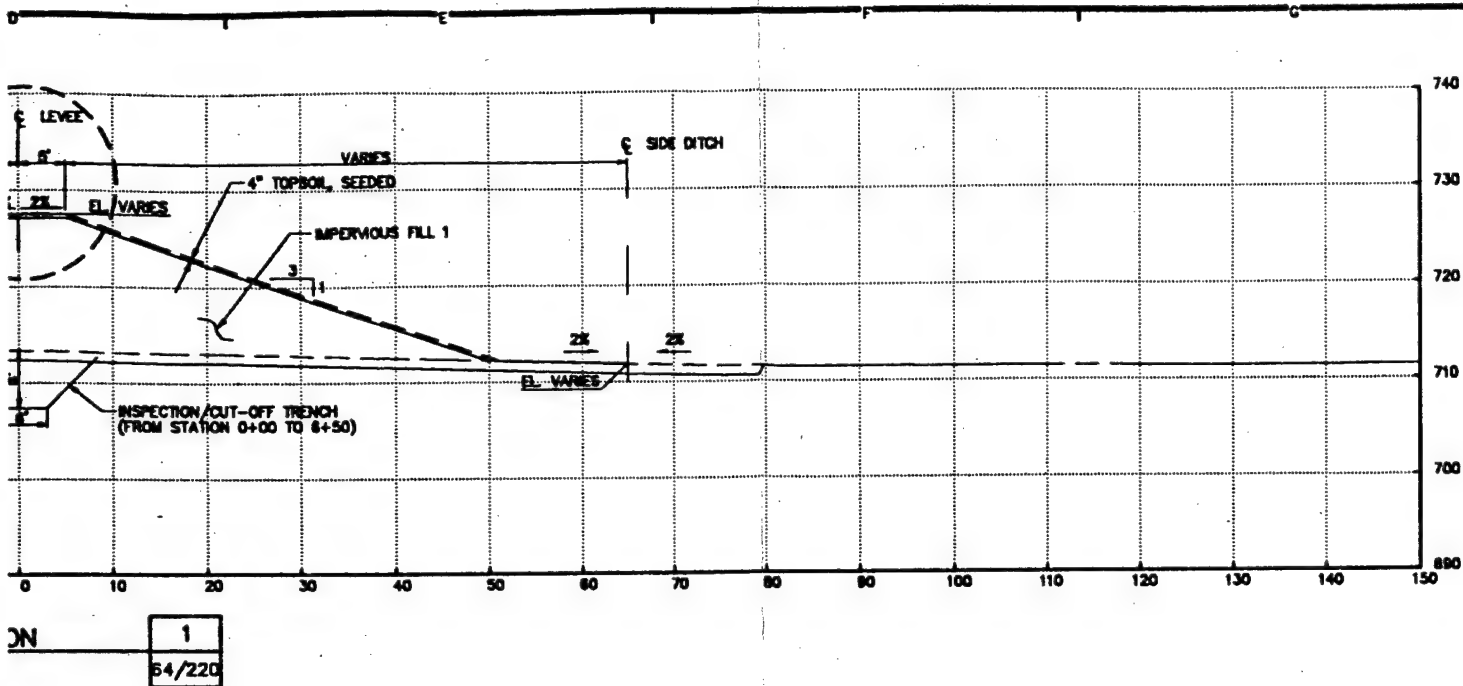
1. GENERAL PLAN	10/201
2. LEVEE ALIGNMENT	84/218
3. WEST INTERCEPTOR	84/258
4. TEMPORARY EROSION CONTROL DETAILS	84/237
5. BITUMINOUS TRAIL TYPICAL	84/238

FIGURE 22

SYMBOL		DESCRIPTION		DATE	APPRO
B R W		PLANNING TRANSPORTATION ENGINEERING URBAN DESIGN		DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA	
DESIGNED: TJS		FLOOD CONTROL - MINNESOTA RIVER CHASKA PROJECT CHASKA, MINNESOTA CHASKA STAGE 4 DRAINAGE & LEVEES PLAN & PROFILE STA. 76+50 TO 83+50			
DRAWN: RSC		ED-8			
CHECKED: TJS		ED-8H			
SUBMITTED BY:		CAD FILE NAME: MN10P009.DWG			
ED-8		DRAWING NUMBER: M34-CH-R-84/228			
DATE: 07-29-92		SHEET NO: 21 OF 11			







OR STAGE 1 CONSTRUCTION AT STA. 7+60.  
OPENING FOR EAST CREEK REALIGNMENT STA. 8+50  
TO BE CONSTRUCTED UNDER STAGE 3.  
TION OF THE LEVEE INVOLVING THE PERVIOUS FILL,  
LD, ETC., SHOWN IS TO BE CONSTRUCTED  
ITA. 28+85.  
TRENCH TO BE 6' MIN., OR 2 FEET BENEATH ANY  
RAVELOR AS DIRECTED BY THE ENGINEER.  
OF SURCHARGE STA. 9+50 TO STA. 10+60

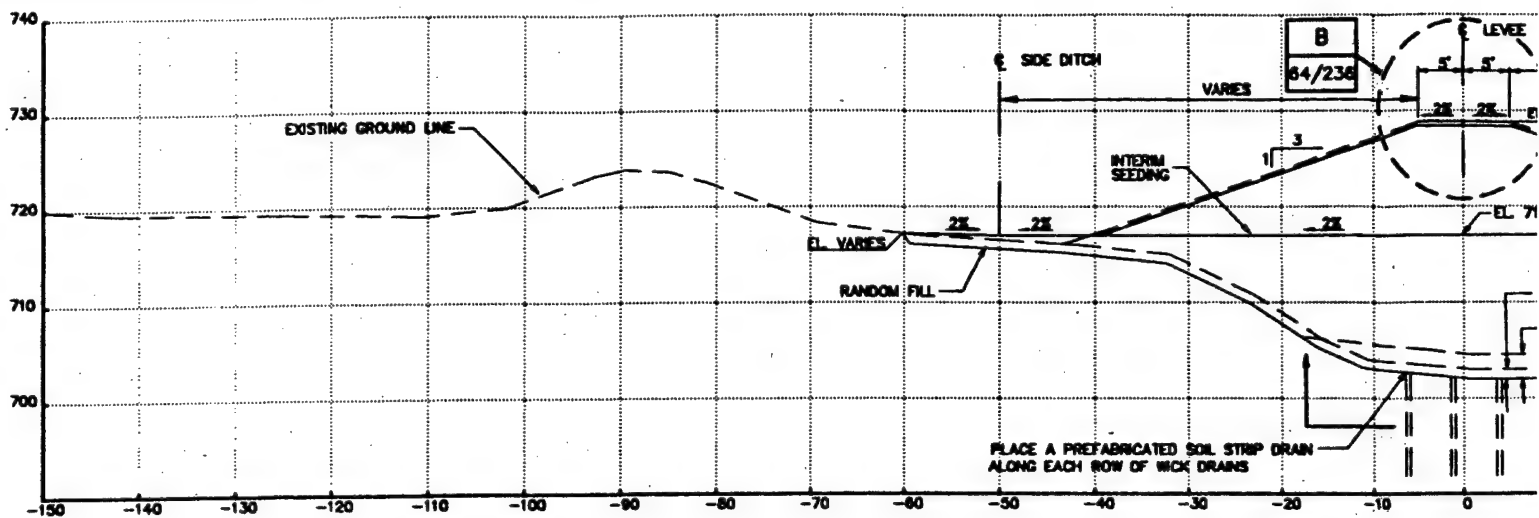
DWG. NO.

CONTROL DETAILS - - - - - 64/237

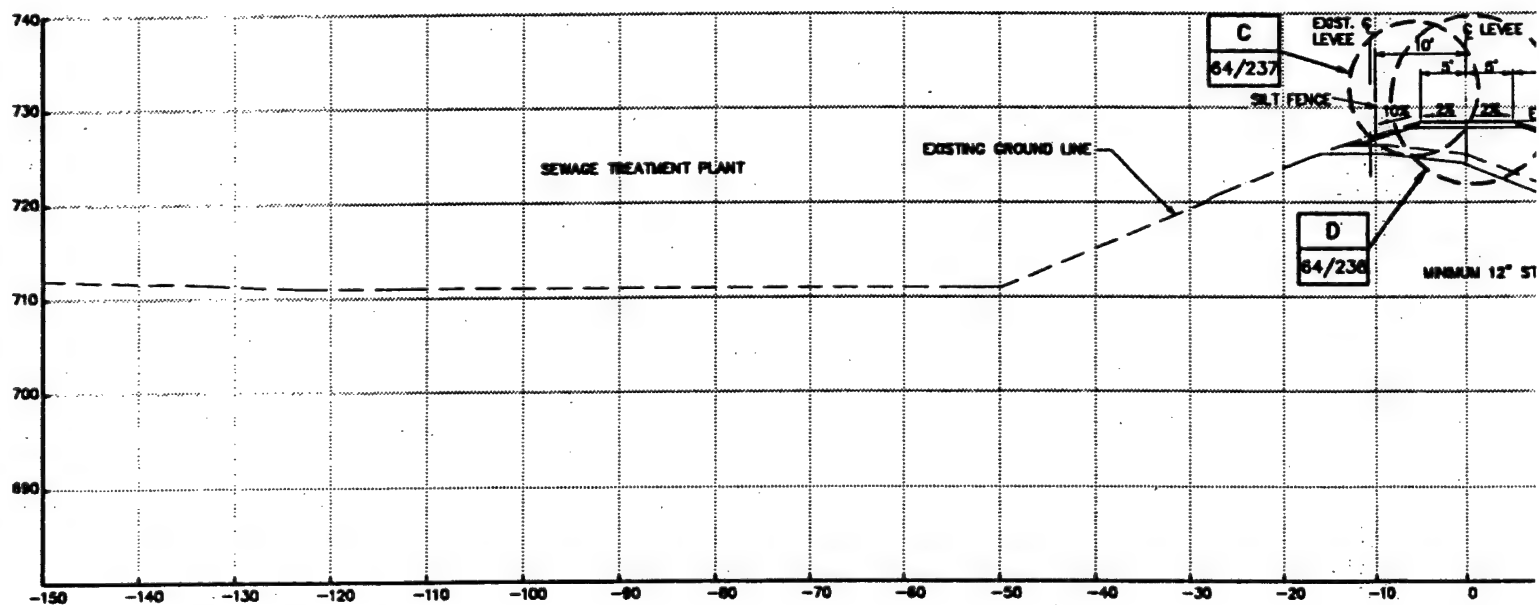


FIGURE 23

SYMBOL	DESCRIPTION	DATE	APPROVAL
<div style="display: flex; justify-content: space-between;"> <div> <p><b>B R W</b></p> <p>DESIGNED: TJS DRAWN: HJR CHECKED: TJS SUBMITTED BY: ED-O ED-GH</p> </div> <div> <p>PLANNING TRANSPORTATION ENGINEERING URBAN DESIGN</p> <p><b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA</p> </div> </div>			
<p>FLOOD CONTROL - MINNESOTA RIVER CHASKA PROJECT CHASKA, MINNESOTA <b>CHASKA STAGE 4</b> DRAINAGE &amp; LEVEES LEVEE TYPICAL SECTIONS STA. 0+00 TO STA. 21+00</p>			
DATE: 07-29-92	CAD FILE NAME: MN10TYP1.DWG	DRAWING NUMBER: <b>M34-CH-R-64/229</b>	SHT 30 OF 119



**TYPICAL SECTION**  
STA. 21+00 TO STA. 21+50



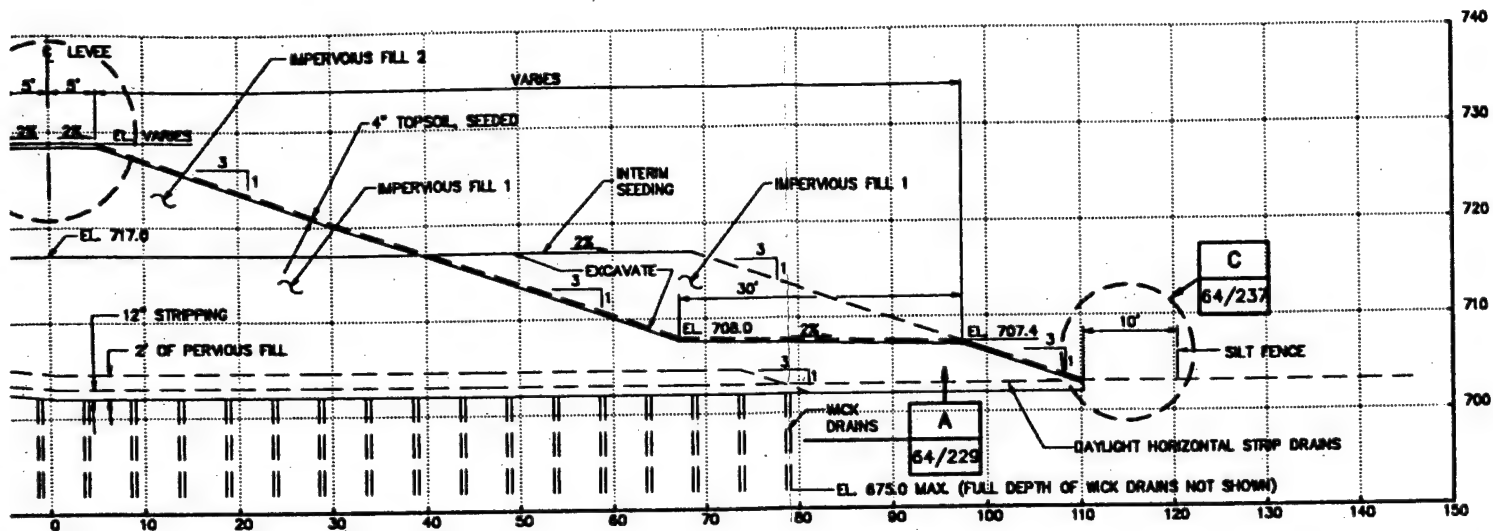
**TYPICAL SECTION**  
STA. 28+85 TO STA. 29+00

**NOTES:**

1. 8' PATH TIES INTO EXISTING BRID
2. PLACE TEMPORARY SILT FENCE A SEWAGE TREATMENT PLANT.
3. MINIMUM 6" STRIPPING ON LANDW AT STA. 34+50.

**REFERENCES:**

1. TEMPORARY EROSION CONTROL DI

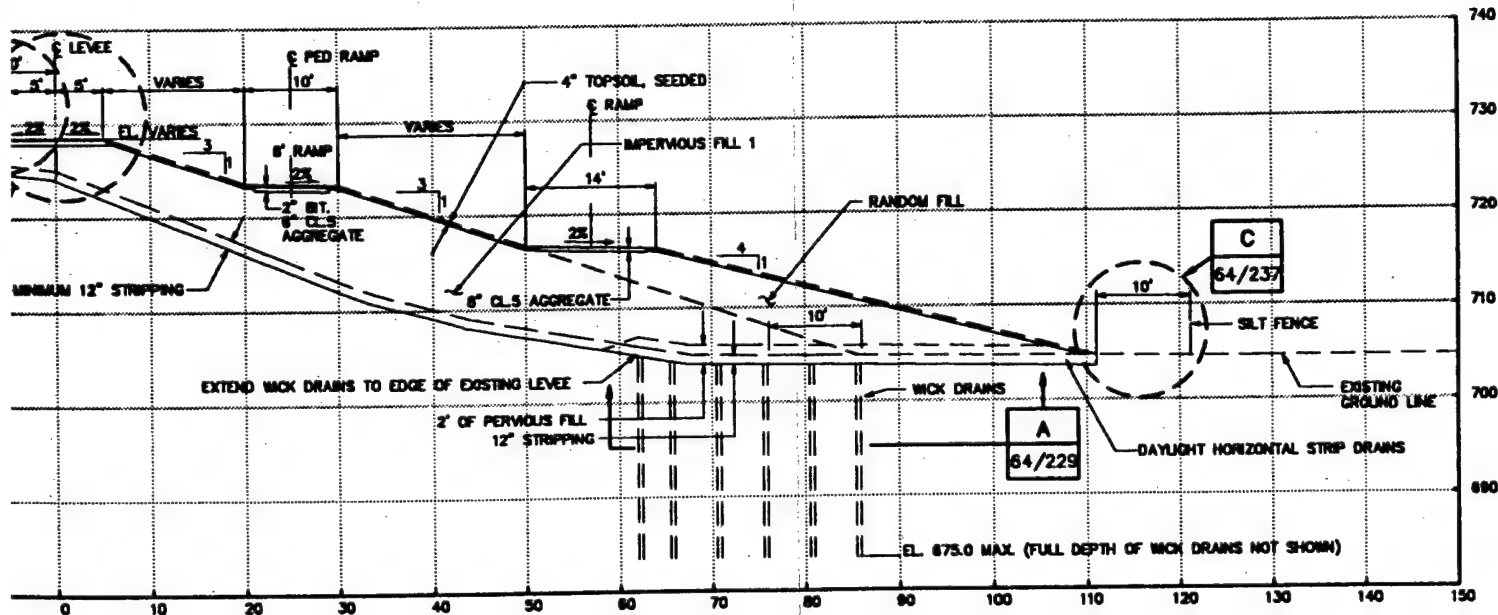


# L SECTION

00 TO STA. 28+85

3

64/222



# AL SECTION

+85 TO STA. 32+00

4

64/223

D EXISTING BRIDGE AT STA. 30+25±.  
Y SILT FENCE AT THE TOP OF EXISTING LEVEE TO PROTECT  
NT PLANT.  
PING ON LANDWARD SIDE OF EXISTING LEVEE BEGINNING

DWG. NO.

NON. CONTROL DETAILS — — — — — 64/237

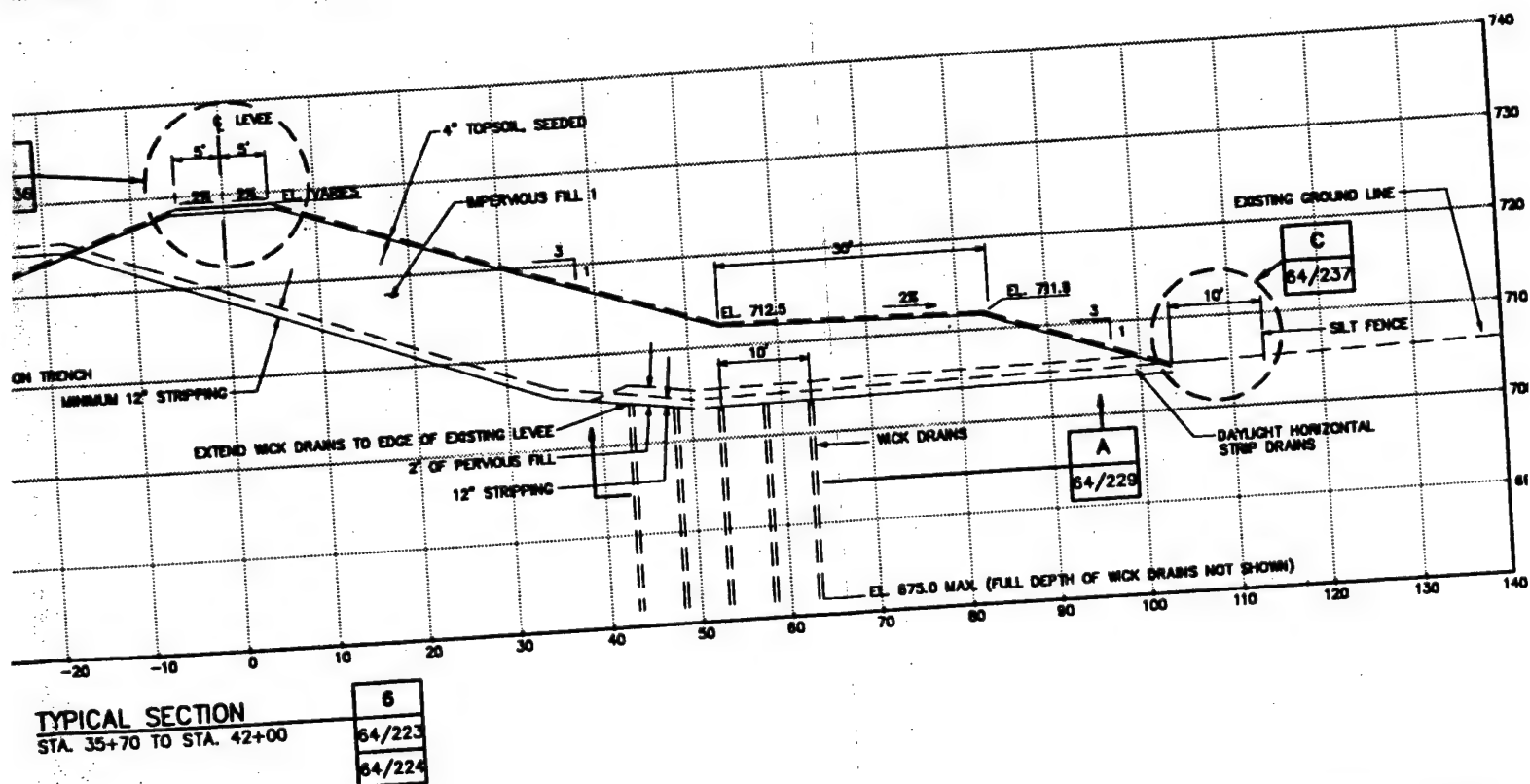


FIGURE 24

SYMBOL	DESCRIPTION	DATE	APPROVAL
<p><b>BRW</b></p> <p>DESIGNED: TJS DRAWN: IKR CHECKED: TJS SUBMITTED BY:</p>			
<p><b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA</p>			
<p><b>FLOOD CONTROL — MINNESOTA RIVER</b> <b>CHASKA PROJECT — CHASKA, MINNESOTA</b> <b>CHASKA STAGE 4</b> <b>DRAINAGE &amp; LEVEES</b> <b>LEVEE TYPICAL SECTIONS</b> <b>STA. 21+00 TO STA. 32+00</b></p>			
ED-0	CAD FILE NAME: MNT01TYP2.DWG	DRAWING NUMBER:	SHEET 31
ED-0H	DATE: 07-20-92	SPEC NO:	OF 119
		M34-CH-R-64/230	

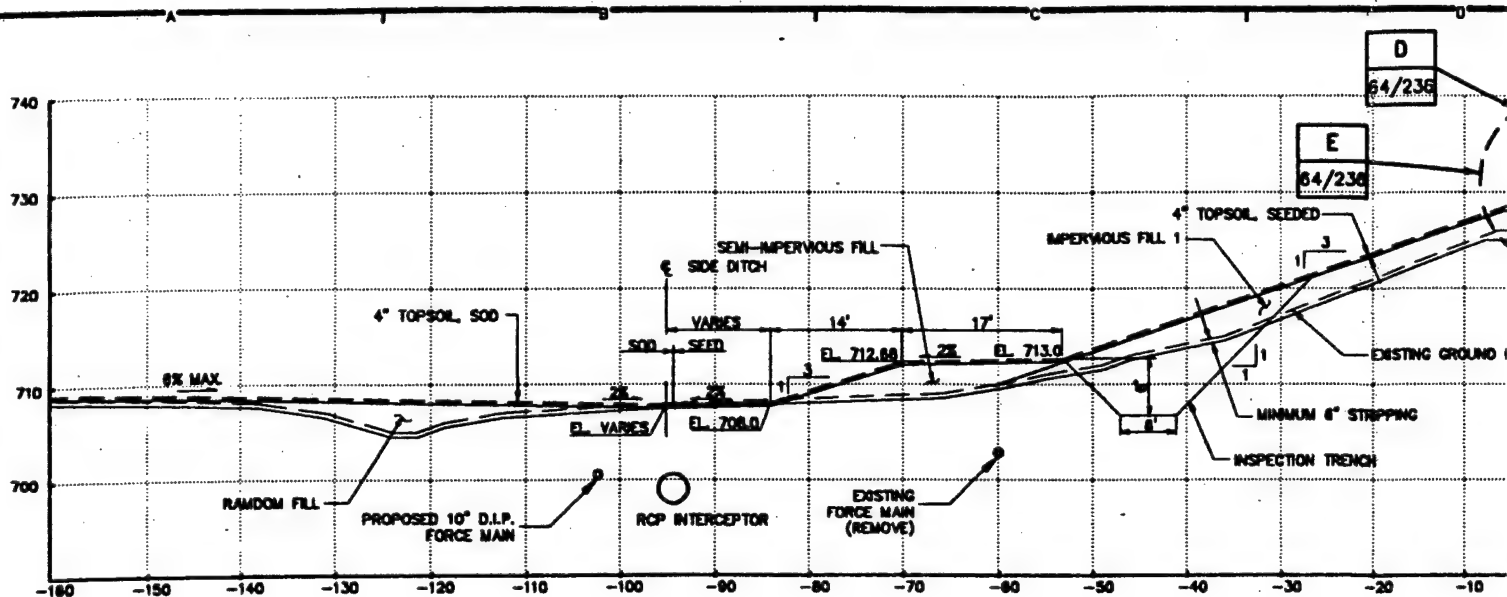




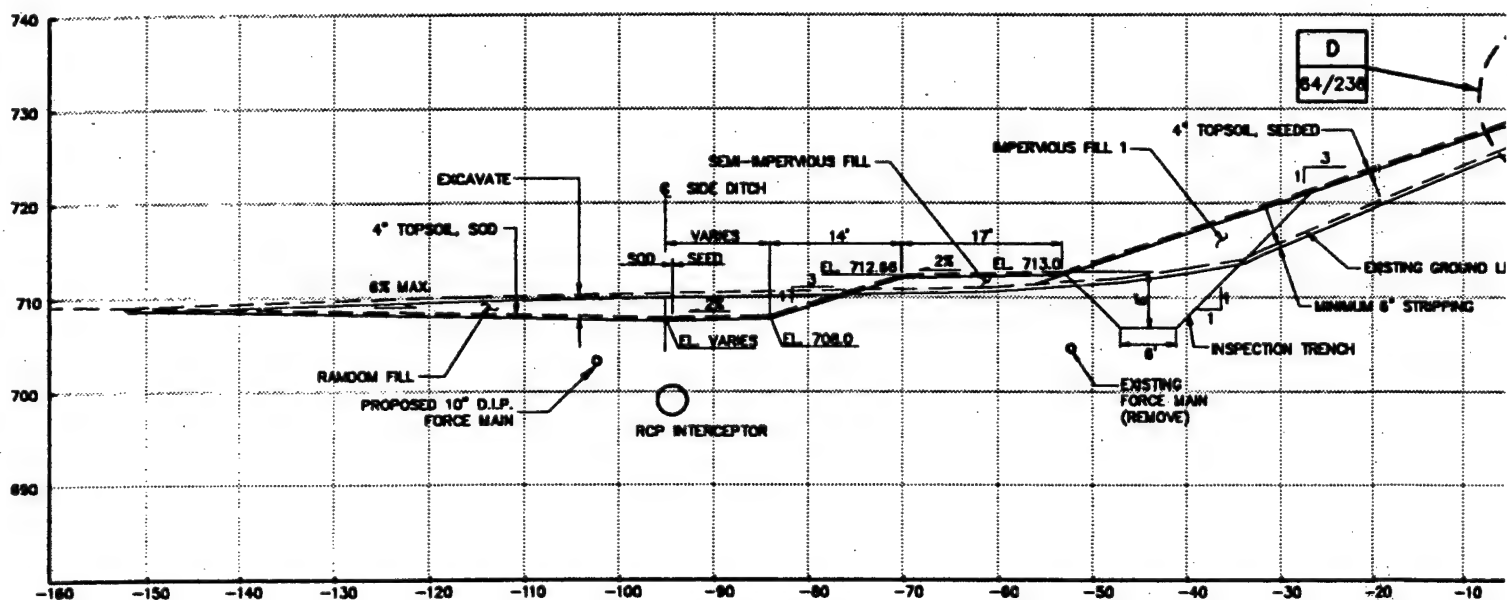


		<b>FIGURE 23</b>	
SYMBOL		DESCRIPTION	DATE
		PLANNING TRANSPORTATION ENGINEERING URBAN DESIGN	<b>DEPARTMENT OF THE ARMY</b> <b>ST. PAUL DISTRICT, CORPS OF ENGINEERS</b> <b>ST. PAUL, MINNESOTA</b>
NOTE: SEE "DESIGNED DRAWING," FOR THESE SHEET SERIAL, MODIFICATIONS, AND DETAILS.			
DESIGNED: TJS		<b>FLOOD CONTROL - MINNESOTA RIVER</b> <b>CHASKA PROJECT CHASKA, MINNEAPOLIS</b> <b>CHASKA STAGE 4</b> <b>DRAINAGE &amp; LEVEES</b> <b>LEVEE TYPICAL SECTIONS</b> <b>STA. 32+00 TO STA. 42+00</b>	
DRAWN: MKR			
CHECKED: TJS			
SUBMITTED BY:			
ED-0			
ED-GH			
DATE: 07-29-82		CAD FILE NAME: MN10TYP3.DWG	DRAWING NUMBER: <b>M34-CH-R-84/231</b>
		SPEC NO:	





**TYPICAL SECT**  
STA 42+00 TO ST.  
STA 57+75 TO ST.



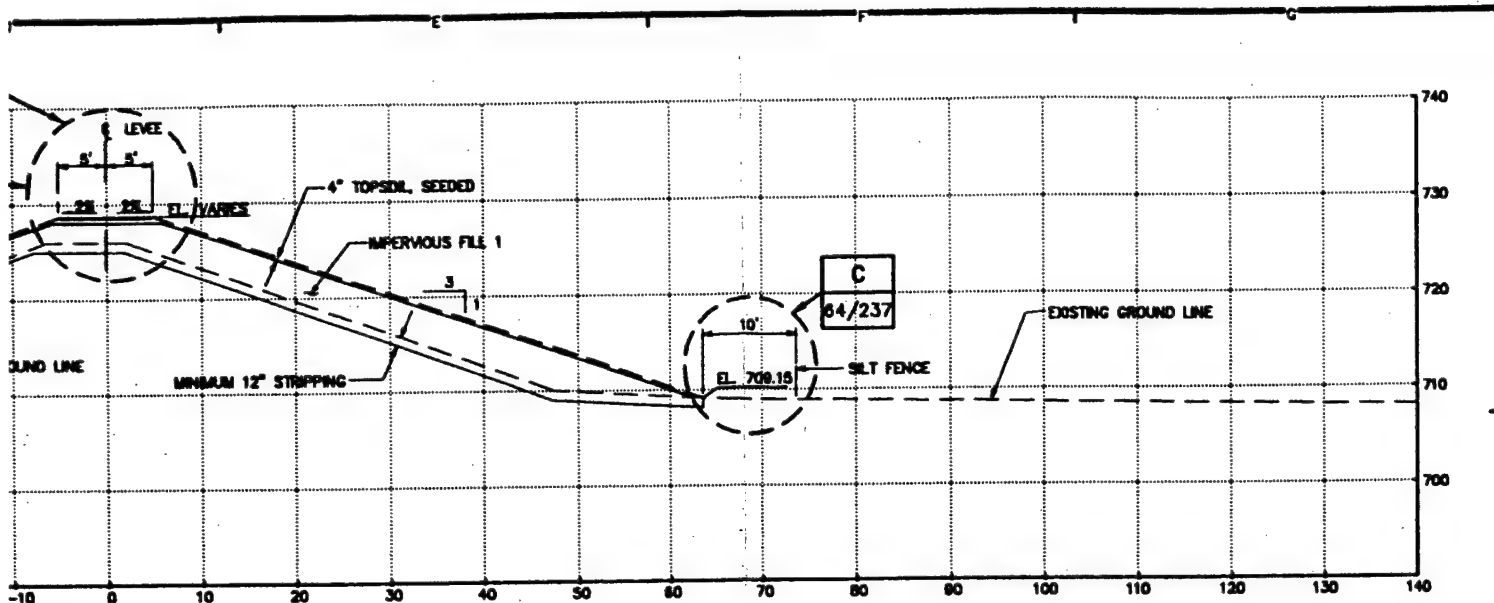
**TYPICAL SECT**  
STA 45+00 TO ST.

#### NOTES:

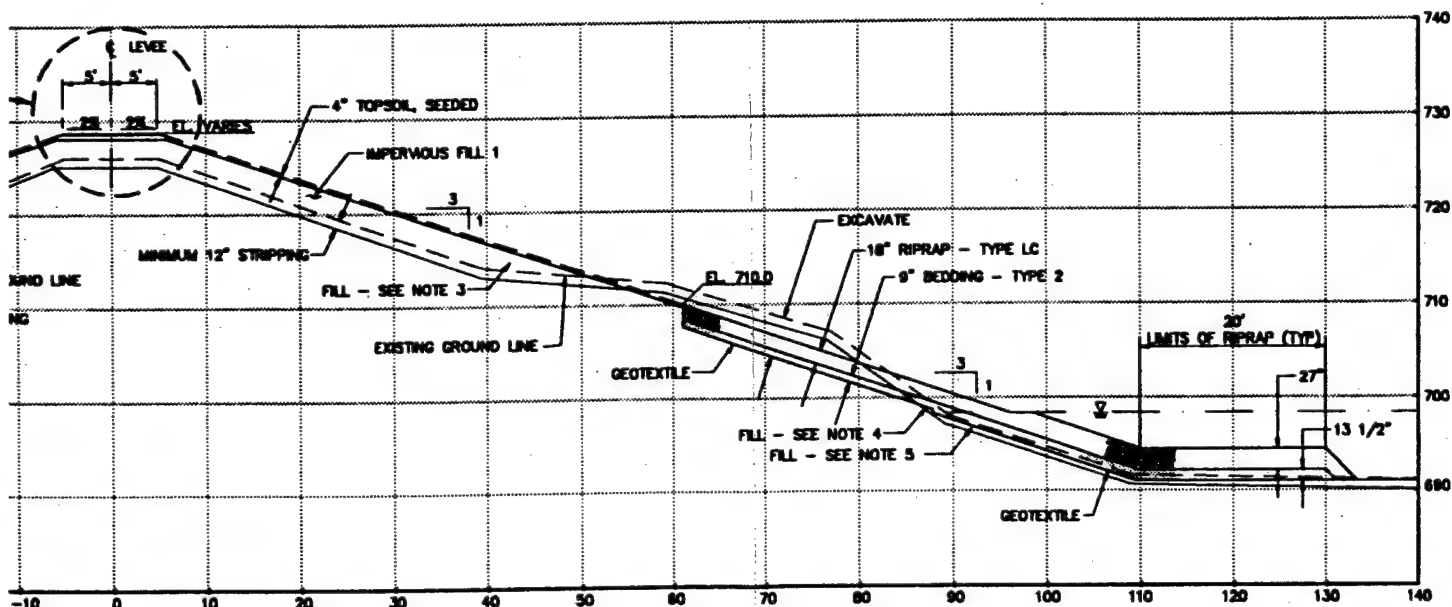
1. BEGIN DETAIL E TYPICAL LEVEL
2. MINIMUM 6" STRIPPING ON LAI
3. FILL ABOVE EL 705 SHALL BE
4. FILL BELOW EL 705 AND ABOVE
5. FILL BELOW EL 705 AND BELOW
6. 18" RIPRAP AND 8" BEDDING
7. WATER ELEVATION SHOWN FOR
8. AREA NORTH OF INTERCEPTOR
- 37+00 TO STA. 71+00.

#### REFERENCES:

1. TEMPORARY EROSION CONTROL
2. EAST INTERCEPTOR PIPE
3. WEST INTERCEPTOR PIPE



SECTION	7
TO STA. 45+00	64/224
TO STA. 59+00	64/226



SECTION	8
TO STA. 52+00	64/224
	64/225

4. LEVEE SECTION AT STA. 53+00  
ON LANDWARD SIDE OF EXISTING LEVEE.  
ALL BE IMPERVIOUS MATERIAL.  
D ABOVE THE WATER SHALL BE RANDOM OR PERVIOUS MATERIAL.  
D BELOW THE WATER SHALL BE PERVIOUS MATERIAL.  
EDDING THICKNESSES ARE INCREASED 50%, TO 27" AND 13 1/2"  
DERWATER PLACEMENT.  
MIN FOR MAY 7, 1992. ELEV. 697.3  
ICEPIOR PIPE TO WORK LIMITS WILL BE 500. STA.  
1.

DWG. NO.

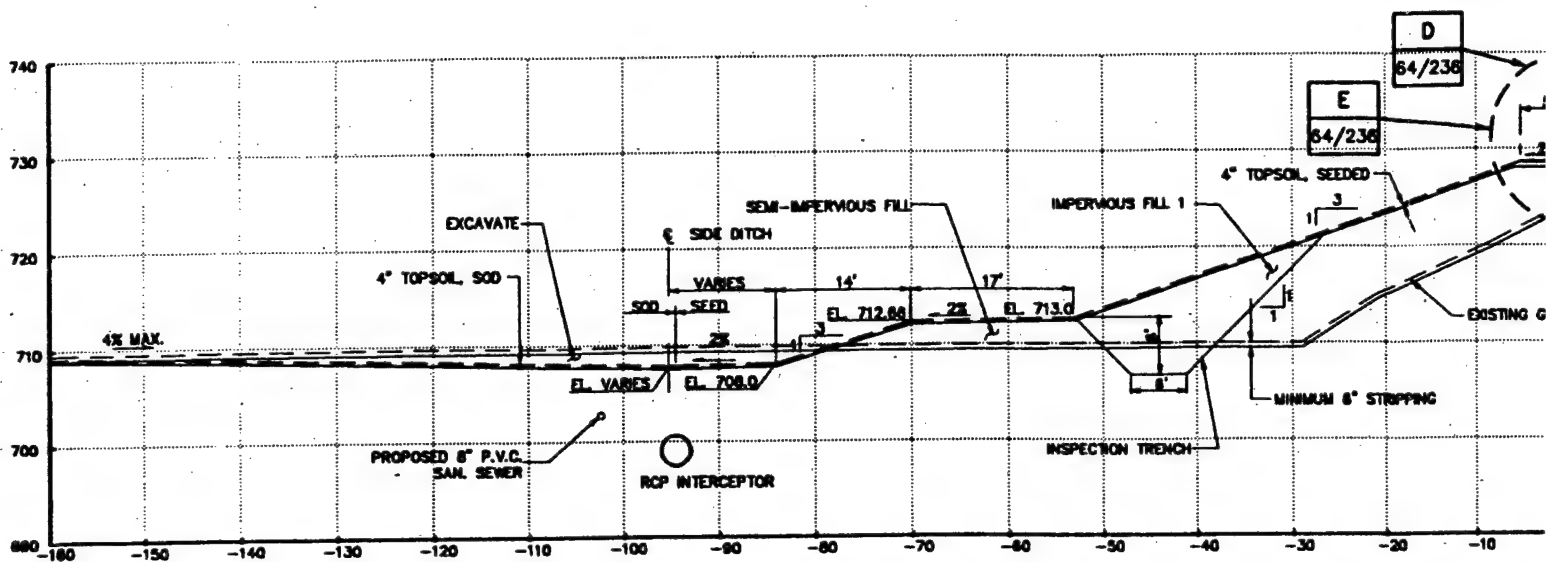
CONTROL DETAILS — — — — — 64/237  
FE — — — — — 64/255  
FE — — — — — 64/258



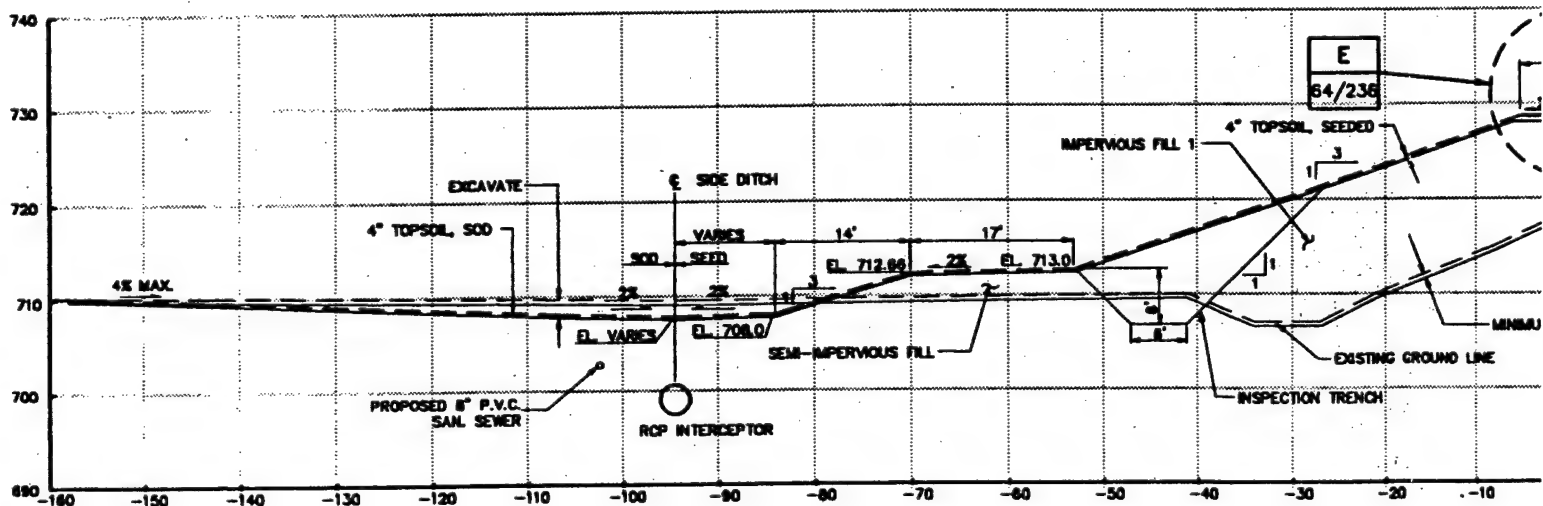
2

FIGURE 26

SYMBOL		DESCRIPTION		DATE	APPROVAL
				<b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA	
DESIGNED: TJS		FLOOD CONTROL - MINNESOTA RIVER			
DRAWN: MKR		CHASKA PROJECT CHASKA, MINNESOTA			
CHECKED: TJS		<b>CHASKA STAGE 4</b>			
SUBMITTED BY:		DRAINAGE & LEVEES			
ED-0		LEVEE TYPICAL SECTIONS			
ED-0H		STA. 42+00 TO STA. 52+00			
DATE: 07-29-92		CAD FILE NAME: MN10TYP4.DWG	DRAWING NUMBER:	SWT 33	OF 119
SPEC NO:		M34-CH-R-64/232			



**TYPICAL SECTION**  
STA. 52+00 TO STA.



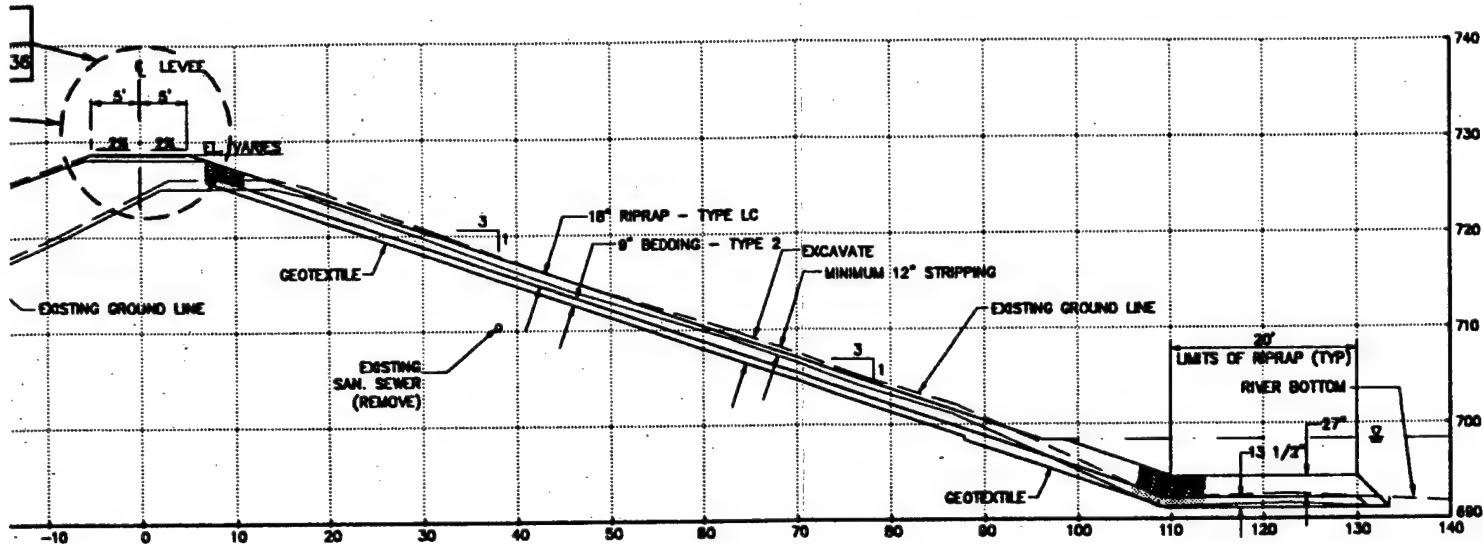
**TYPICAL SECTION**  
STA. 52+50 TO STA.

**NOTES:**

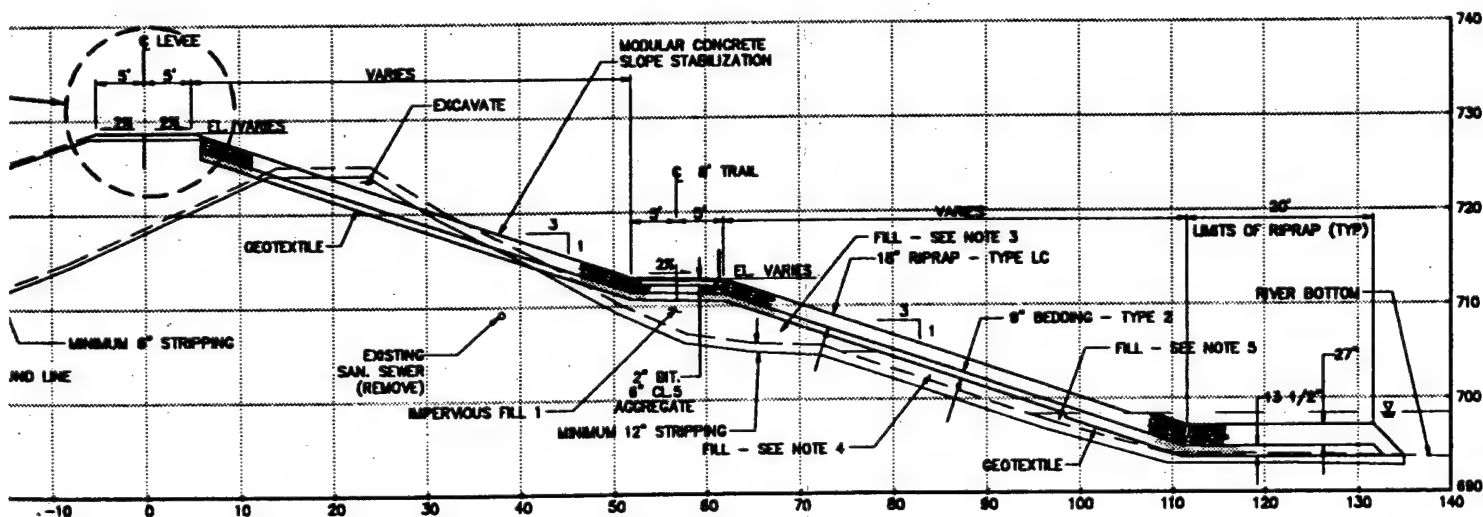
1. PROVIDE 10' MINIMUM CLEARANCE
2. MINIMUM 6" STRIPPING ON LANDW.
3. FILL ABOVE EL.705 SHALL BE IMP
4. FILL BELOW EL.705 AND ABOVE TI
5. FILL BELOW EL.705 AND BELOW TI
6. 18" RIPRAP AND 9" BEDDING THIC
7. CHINK TOP OF RIPRAP LAYER BEN
8. WATER ELEVATION SHOWN FOR MA
9. AREA NORTH OF INTERCEPTOR PIF

**REFERENCES:**

1. WEST INTERCEPTOR PIPE
2. SAFETY RAIL



SECTION 9  
TO STA. 52+50  
64/225



L SECTION 10  
50 TO STA. 57+75  
64/225  
64/228

1M CLEARANCE UNDER U.S. 41 BRIDGE.  
ING ON LANDWARD SIDE OF EXISTING LEVEE.  
SHALL BE IMPERVIOUS MATERIAL.  
AND ABOVE THE WATER SHALL BE RANDOM OR PERVIOUS MATERIAL.  
AND BELOW THE WATER SHALL BE PERVIOUS MATERIAL.  
BEDDING THICKNESSES ARE INCREASED 50%, TO 27\"/>

DWG. NO.

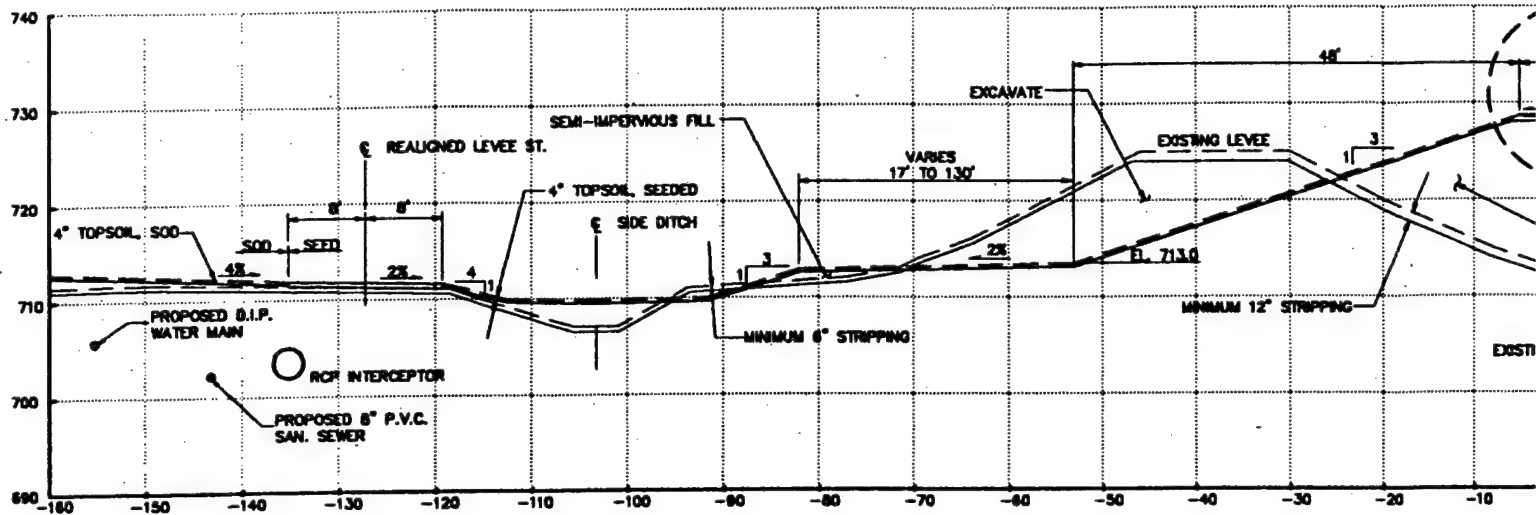
PIPE 64/258  
64/307



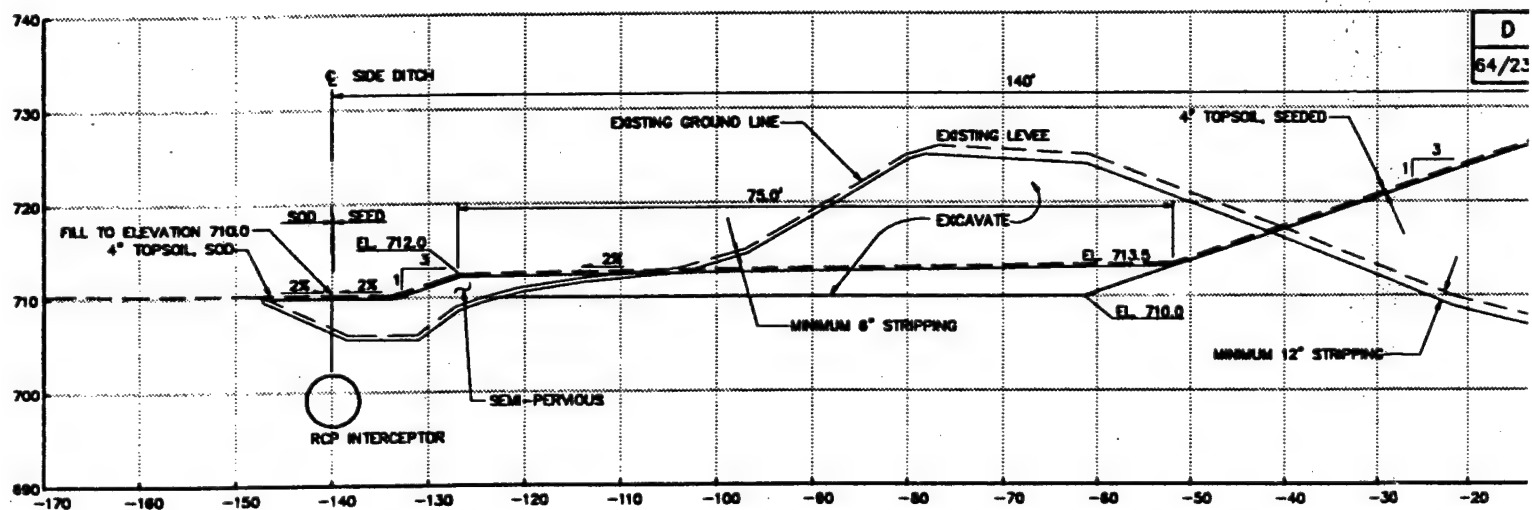
2

FIGURE 27

SYMBOL	DESCRIPTION	DATE	APPROVAL
<div style="display: flex; justify-content: space-between;"> <div> <p><b>B R W</b></p> <p>DESIGNED: TJS DRAWN: IKR CHECKED: TJS SUBMITTED BY: ED-D ED-SH</p> </div> <div> <p>PLANNING TRANSPORTATION ENGINEERING URBAN DESIGN</p> </div> <div> <p><b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA</p> </div> </div>			
<p>FLOOD CONTROL - MINNESOTA RIVER CHASKA PROJECT CHASKA, MINNESOTA <b>CHASKA STAGE 4</b> DRAINAGE &amp; LEVEES LEVEE TYPICAL SECTIONS STA. 52+00 TO STA. 57+75</p>			
CAD FILE NAME: MN10TYP5.DWG		DRAWING NUMBER:	SHEET 34
DATE: 07-29-92		SPEC NO:	OF 119
		M34-CH-R-64/233	



**TYPICAL SECTION**  
STA. 59+00 TO STA.



**TYPICAL SECTION**  
STA. 63+50 TO STA.

**NOTES:**

1. END DETAIL D TYPICAL LEVEE SE
2. MINIMUM 6" STRIPPING ON LAND
3. AREA NORTH OF INTERCEPTOR P  
37+00 TO STA. 71+00.

**REFERENCES:**

1. TEMPORARY EROSION CONTROL C
2. WEST INTERCEPTOR PIPE —

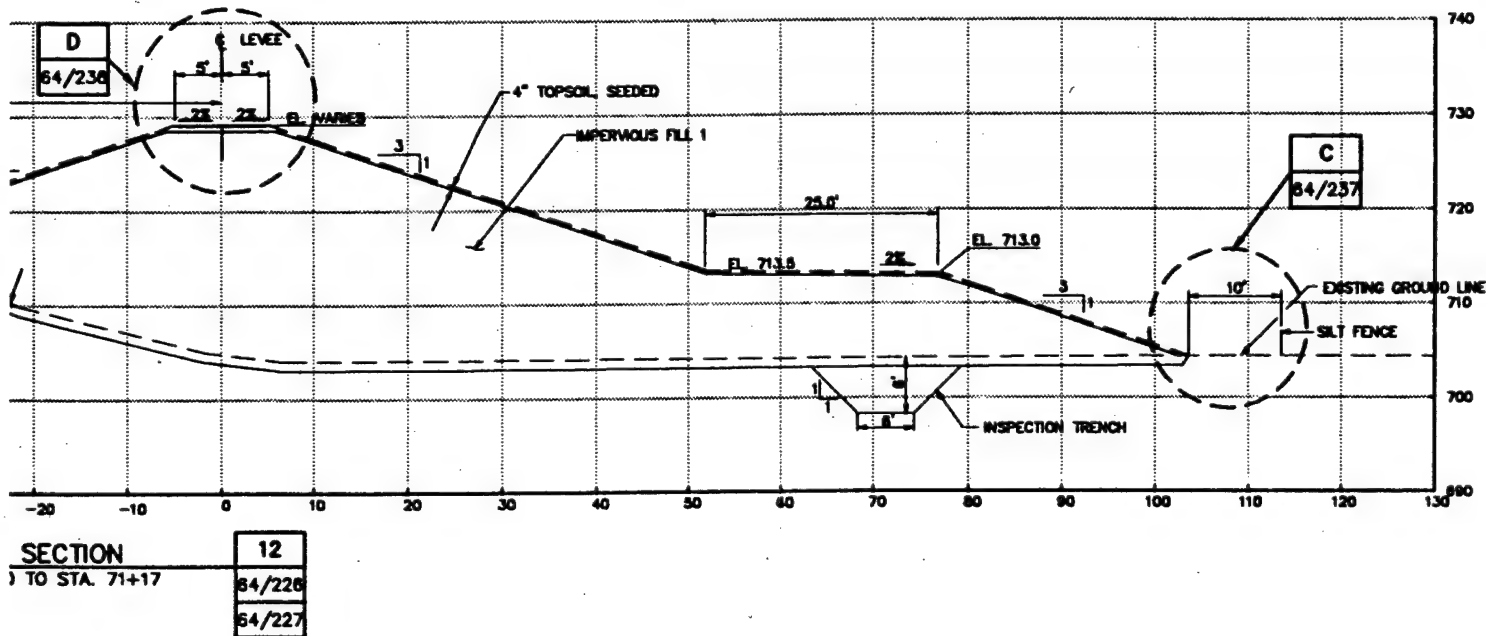
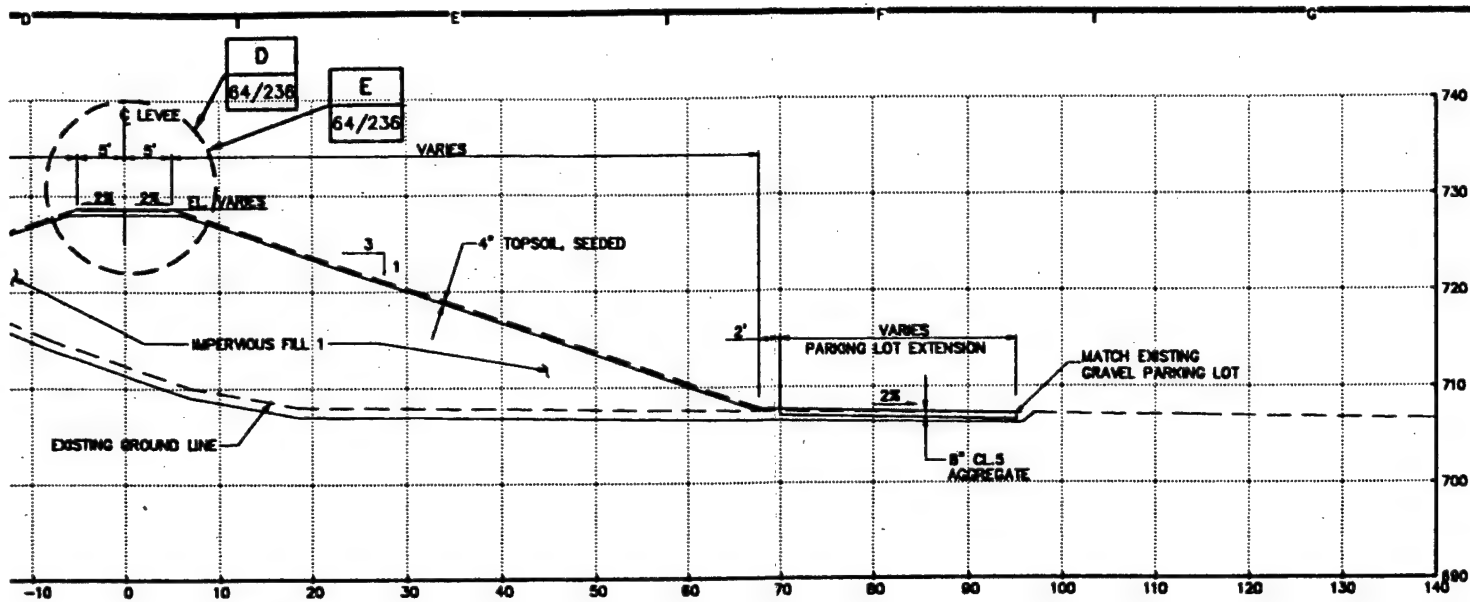


FIGURE 28

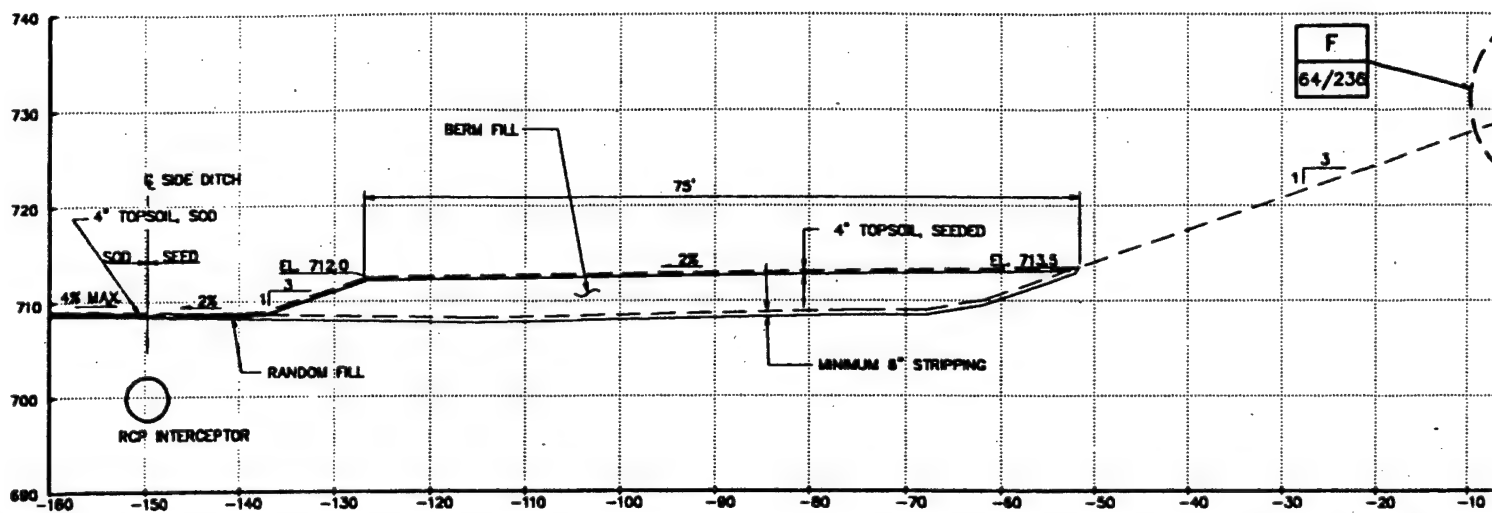
1. LEVEE SECTION AT STA. 62+57  
2. IG ON LANDWARD SIDE OF EXISTING LEVEE.  
3. RECEPTOR PIPE TO WORK LIMITS WILL BE SOD, STA. 63+00.

DWG. NO.

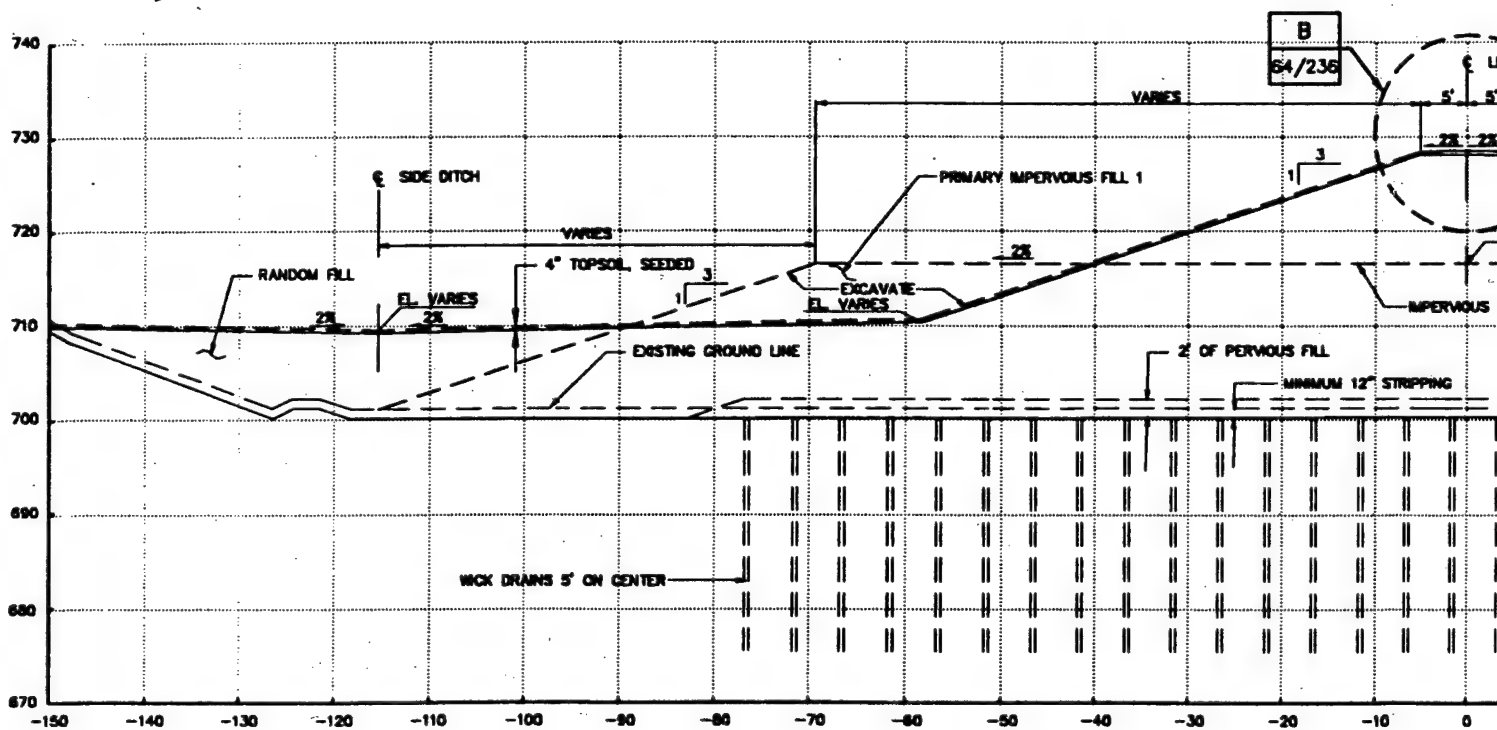
CONTROL DETAILS ——— 64/237  
SPE ——— 64/256



SYMBOL		DESCRIPTION		DATE	APPROVAL
BRW		PLANNING TRANSPORTATION ENGINEERING URBAN DESIGN			
DESIGNED: TJS DRAWN: IKR CHECKED: TJS SUBMITTED BY: ED-D ED-GH		DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
DATE: 07-29-92		FLOOD CONTROL - MINNESOTA RIVER CHASKA PROJECT CHASKA, MINNESOTA CHASKA STAGE 4 DRAINAGE & LEVEES LEVEE TYPICAL SECTIONS STA. 57+75 TO STA. 71+17		CAD FILE NAME: MN10TYP6.DWG	DRAWING NUMBER: M34-CH-R-64/234
SPEC NO.				SHEET 35	OF 119



**TYPICAL SECTION**  
STA. 71+17 TO STA. 78+60



**TYPICAL SECTION**  
STA. 15+00 TO STA. 21+00

**NOTES:**

1. ADD 2" BITUMINOUS TO EXG DONE HAULING STA. 71+17
2. AREA NORTH OF INTERCEPTOR 37+00 TO STA. 71+00.

**REFERENCES:**

1. WEST INTERCEPTOR PIPE



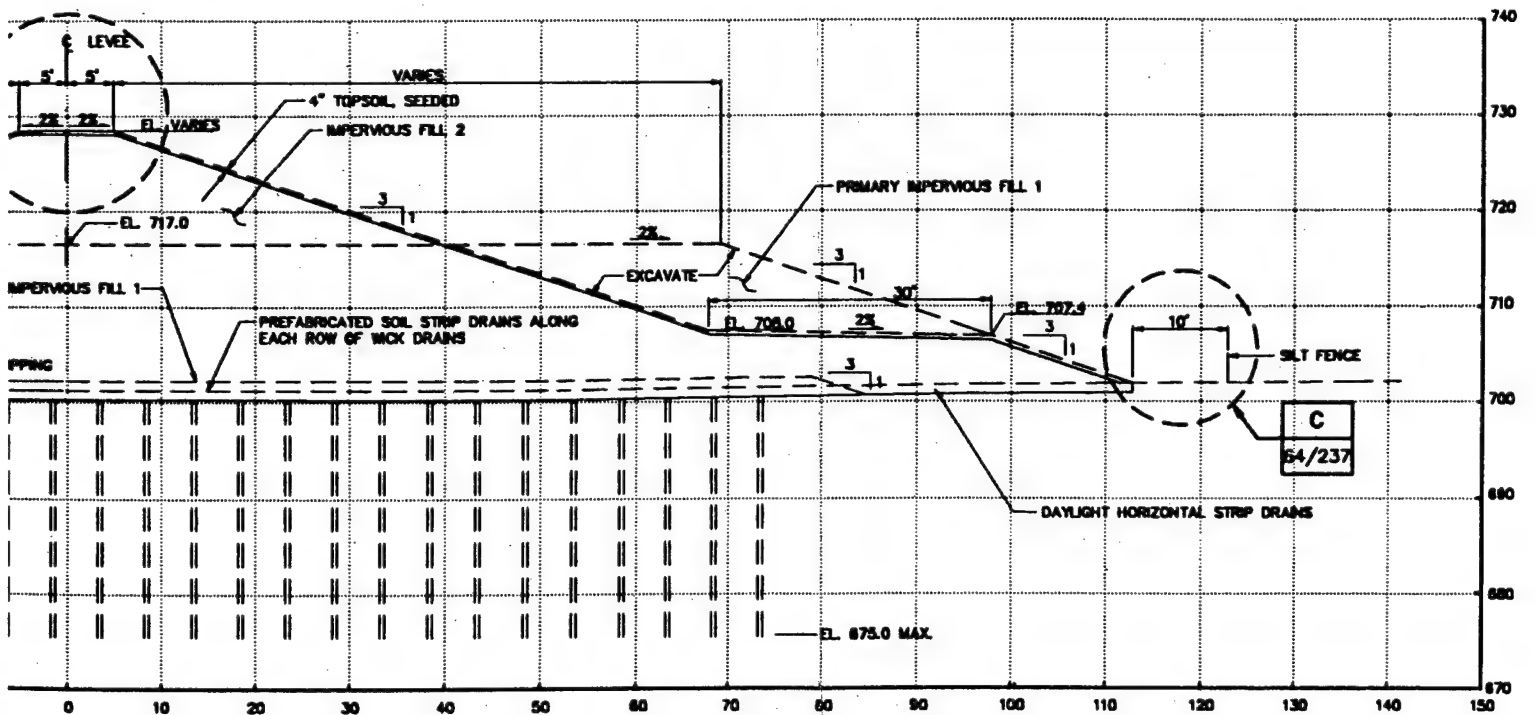
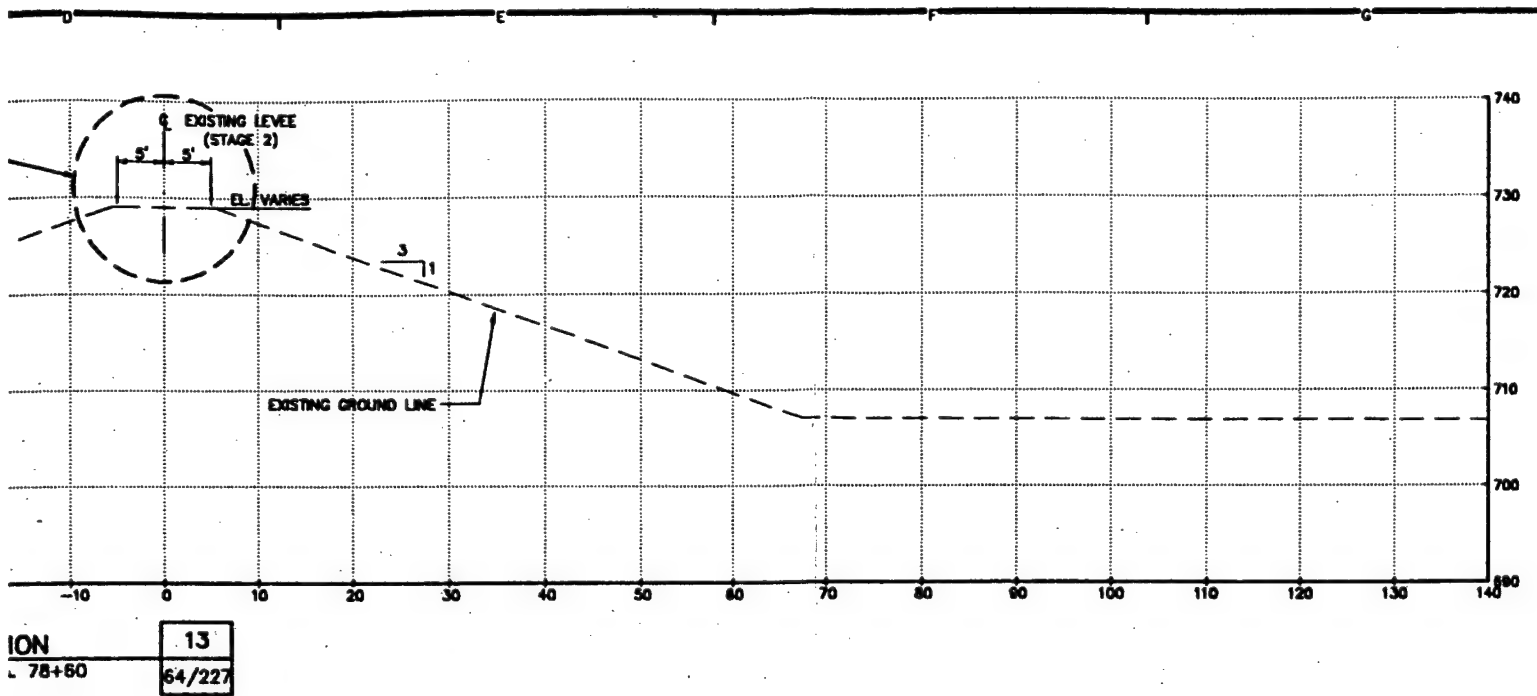



FIGURE 29

DUE TO EXISTING 6" AGGREGATE BASE AFTER TRUCKS ARE  
STA. 71+17 TO STA. 78+60.  
INTERCEPTOR PIPE TO WORK LIMITS WILL BE SOD, STA.  
71+00.

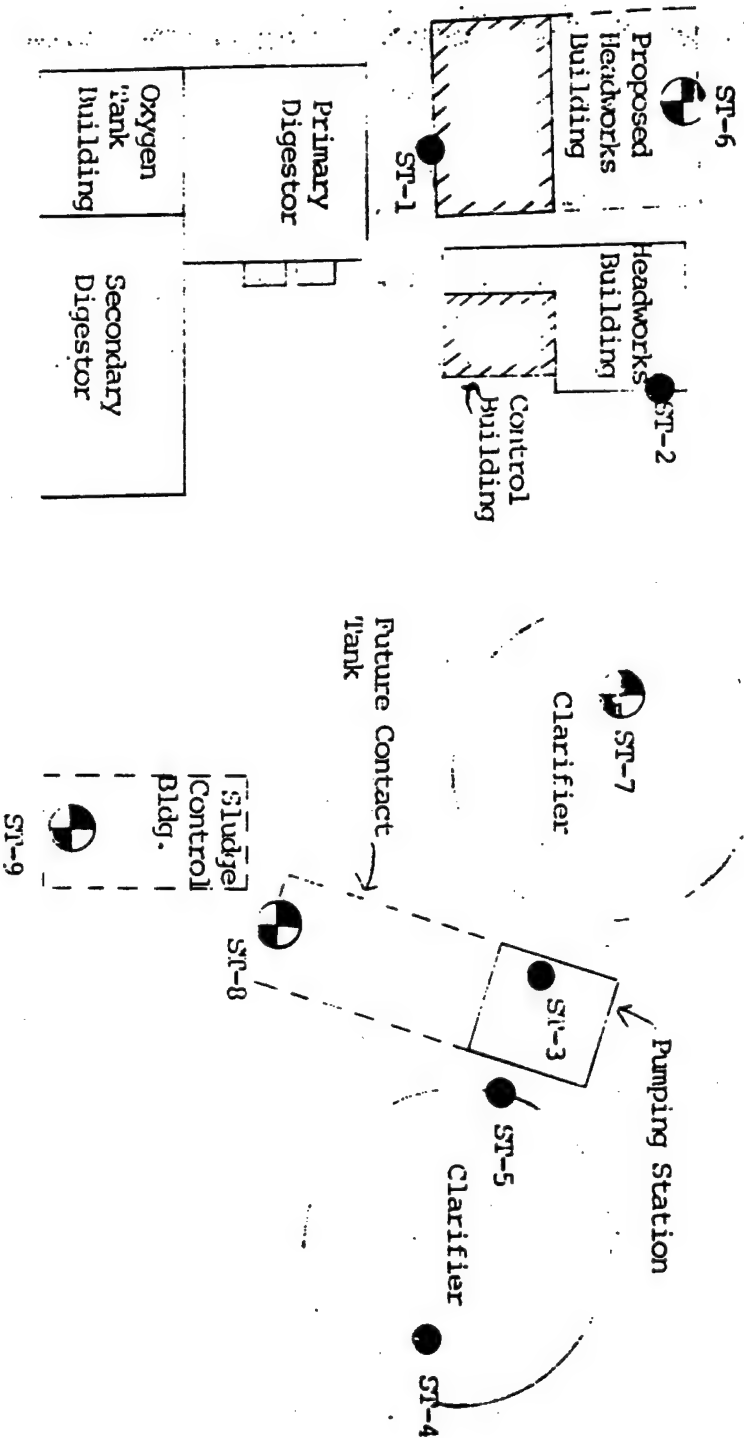
DWG. NO.

OR PIPE 64/256



SYMBOL	DESCRIPTION	DATE	APPROVAL
<div style="display: flex; justify-content: space-between;"> <div>  <p>DESIGNED: TJS DRAWN: MKR CHECKED: TJS SUBMITTED BY: ED-0</p> </div> <div> <p>PLANNING TRANSPORTATION ENGINEERING URBAN DESIGN</p> </div> <div> <p>DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA</p> </div> </div>			
<p>FLOOD CONTROL - MINNESOTA RIVER CHASKA PROJECT CHASKA, MINNESOTA CHASKA STAGE 4 DRAINAGE &amp; LEVEES LEVEE TYPICAL SECTIONS STA. 71+17 TO STA. 78+50</p>			
<p>ED-0H CAD FILE NAME: MN10TYP7.DWG</p>		<p>DRAWING NUMBER: M34-CH-R-64/235</p>	
<p>DATE: 07-29-92</p>		<p>SHT 36 OF 119</p>	





- Represents location of borings taken in 1974 and 1978
- ⊗ Represents location of recent standard penetration test boring.

FIGURE 30

85-082 FOUNDATION INVESTIGATION  
Proposed Chaska Treatment Plant Expansion  
Chaska, Minnesota

**BRAUN**

Date: 3/27/85  
Revised: -  
Drawn: EMB/RAH  
Scale: 1"=40'

# SOIL BORING LOCATIONS



- LEGEND**
- ◆ BORING LOCATION
  - ◆ PROPOSED BORING
  - ◆ NOT PERFORMED

CARVER COUNTY GOVERNMENT CENTER

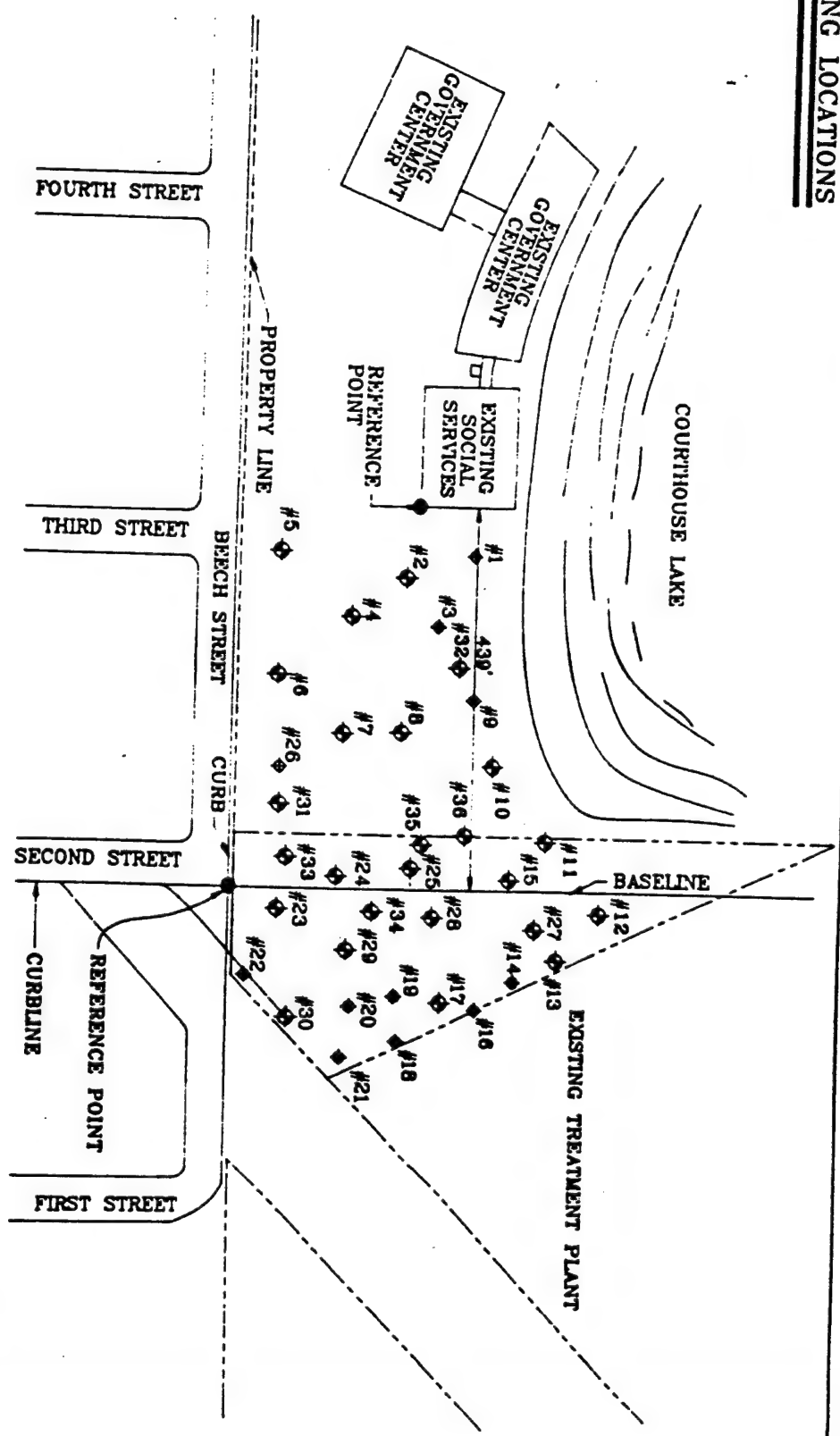
CHASKA, MINNESOTA

SCALE: 1"=120'

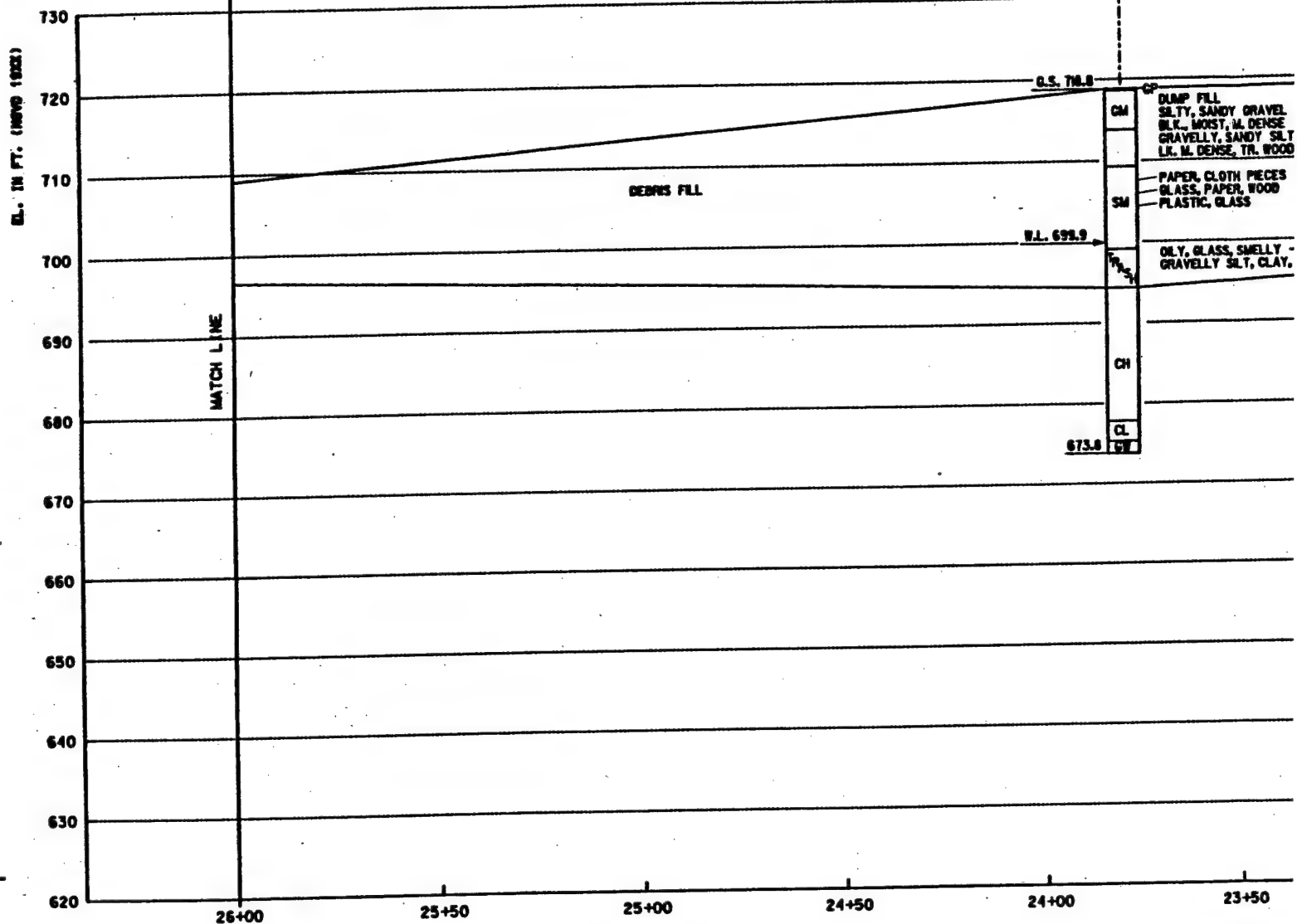
(APPROXIMATELY)

JOB NO. 4220 89-1312

Figure 31



23+80  
82-51M  
16-18 OCT 1982



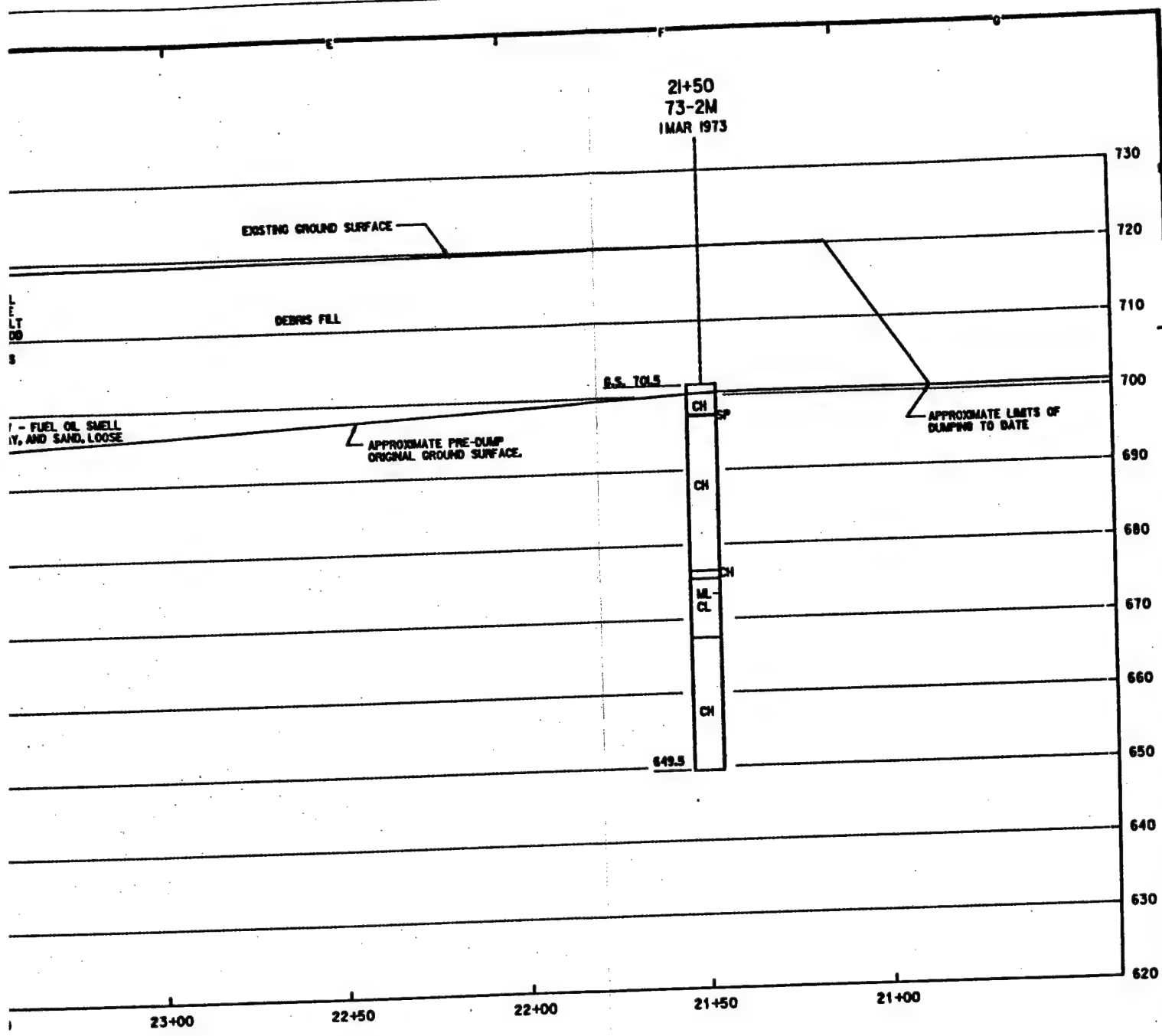
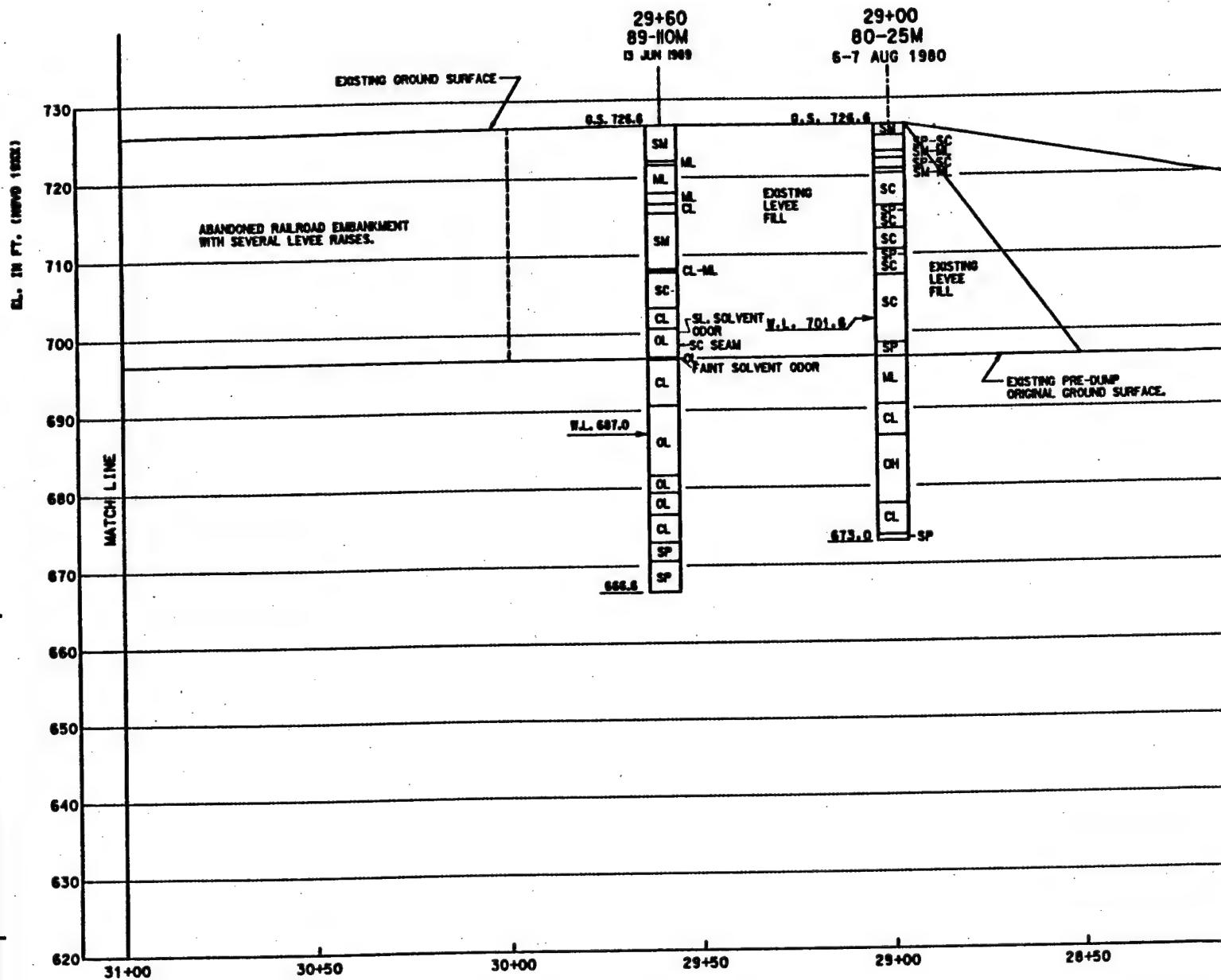


FIGURE 32



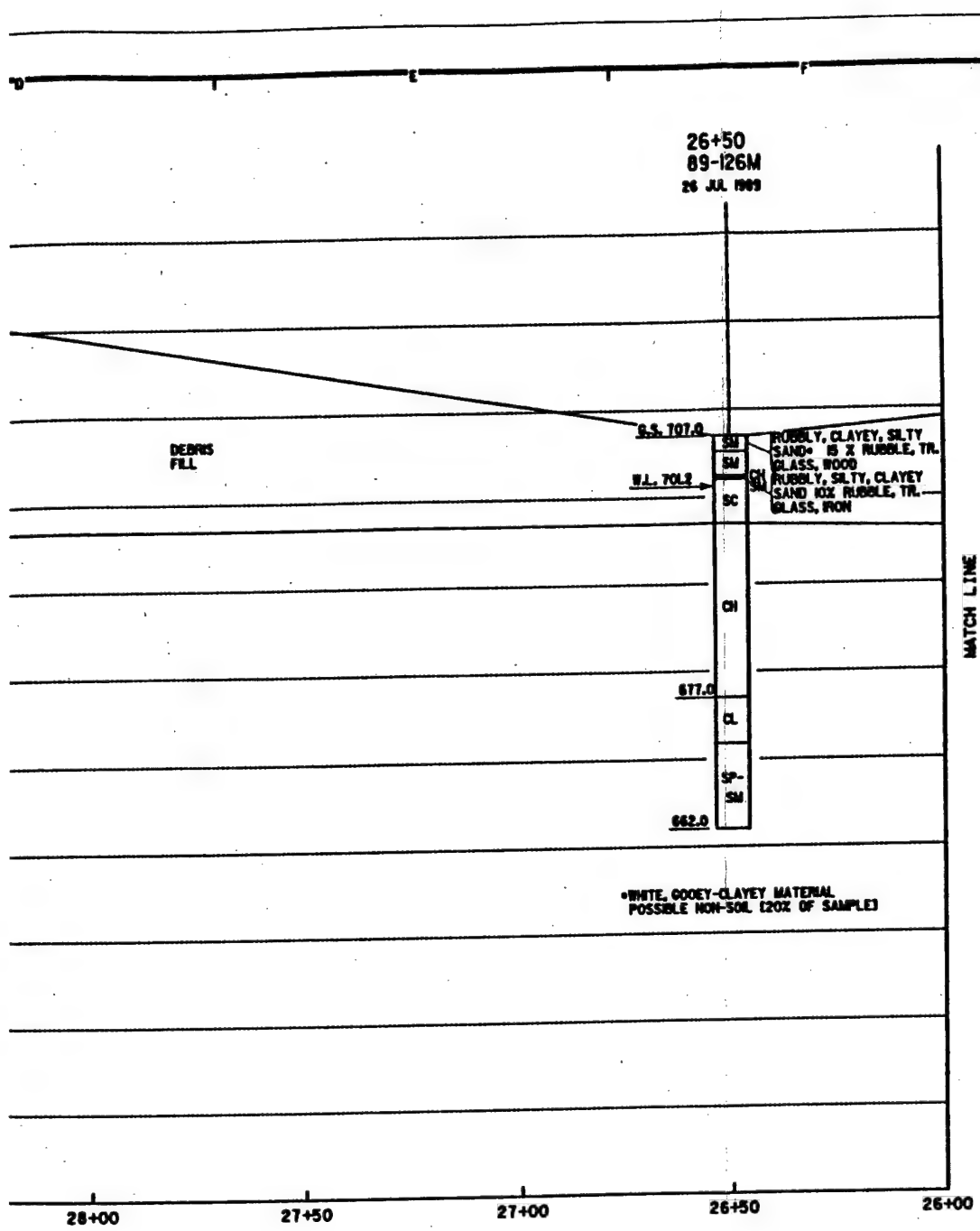
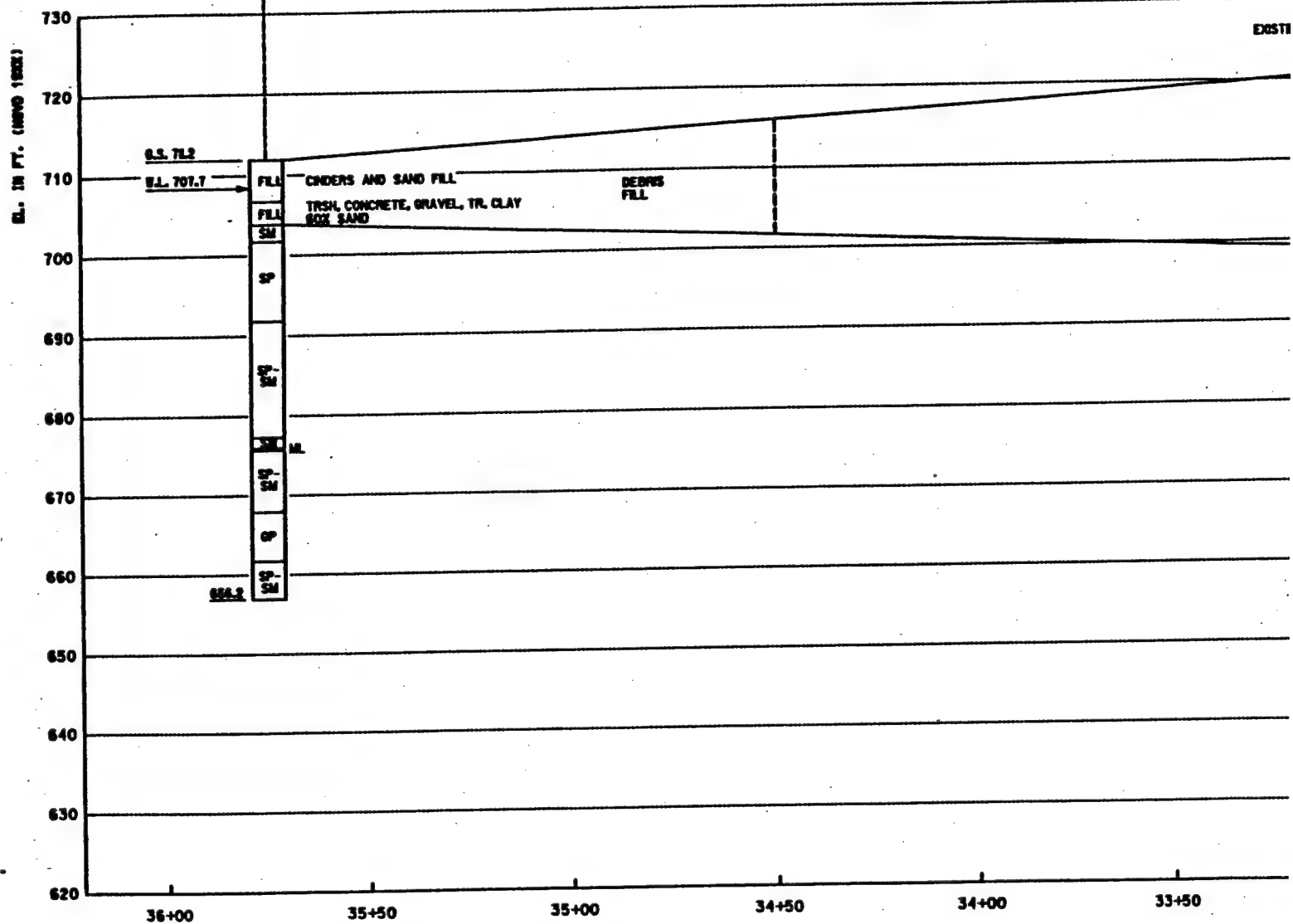


FIGURE 33

35+75  
79-12M  
4 MAY 1979



31+60  
89-106M  
26-27 MAY 1988

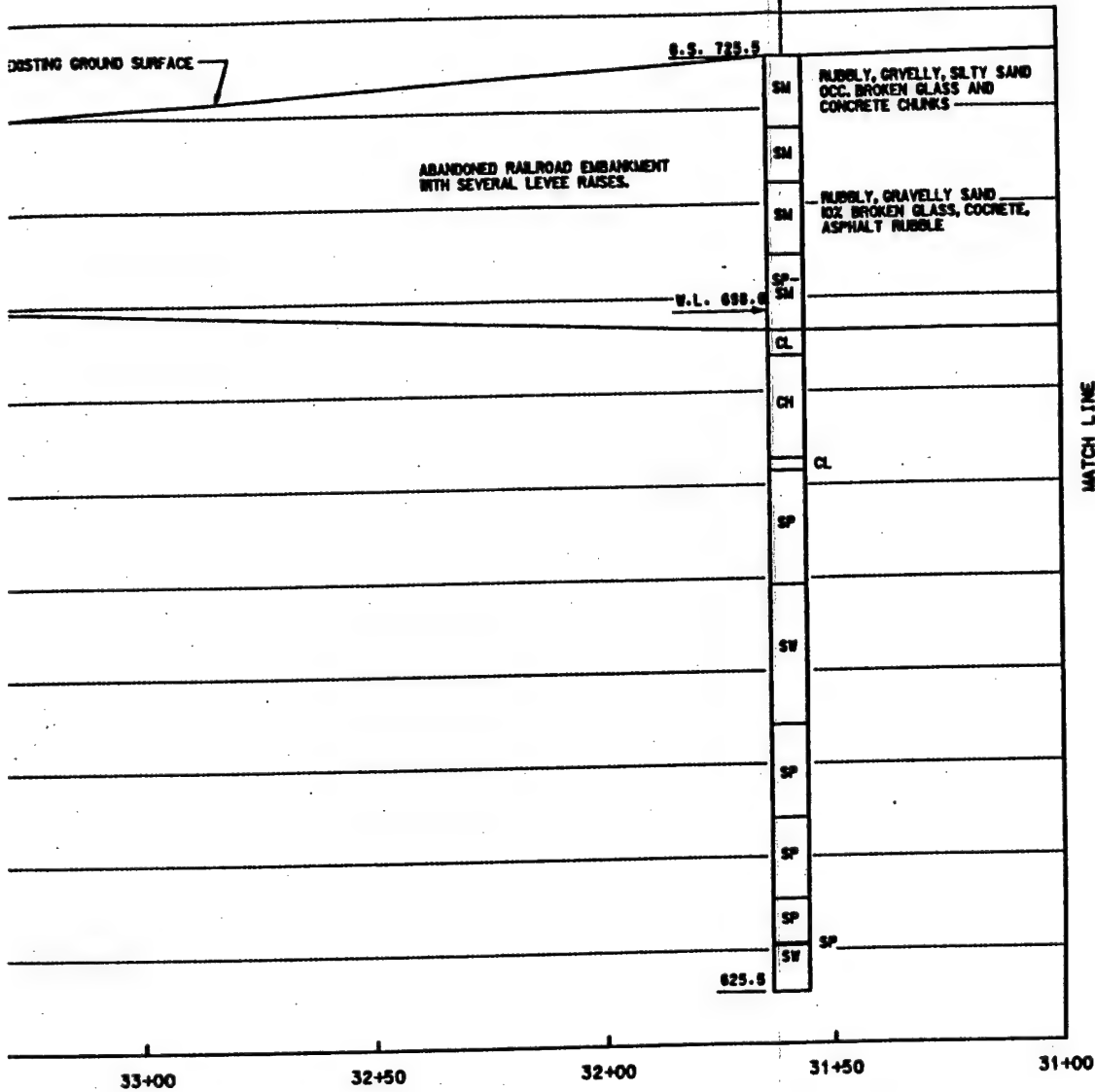
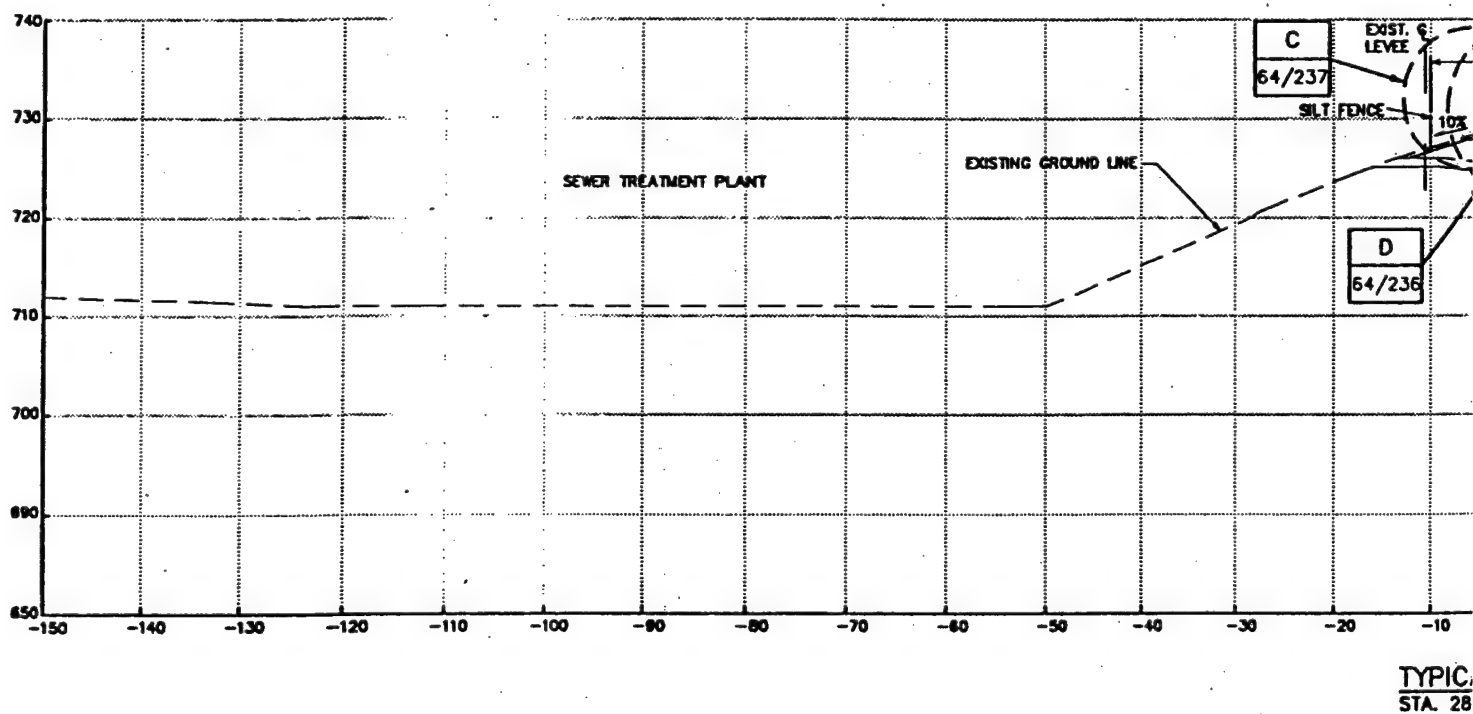
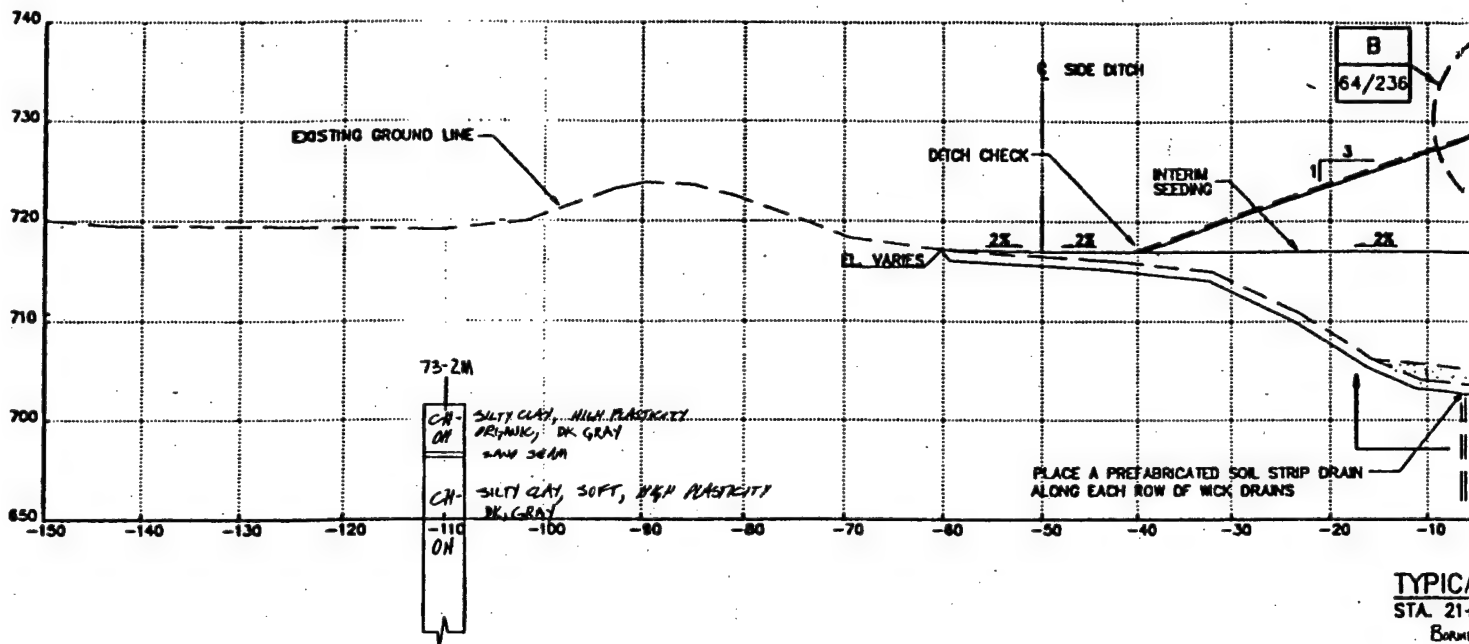


FIGURE 34



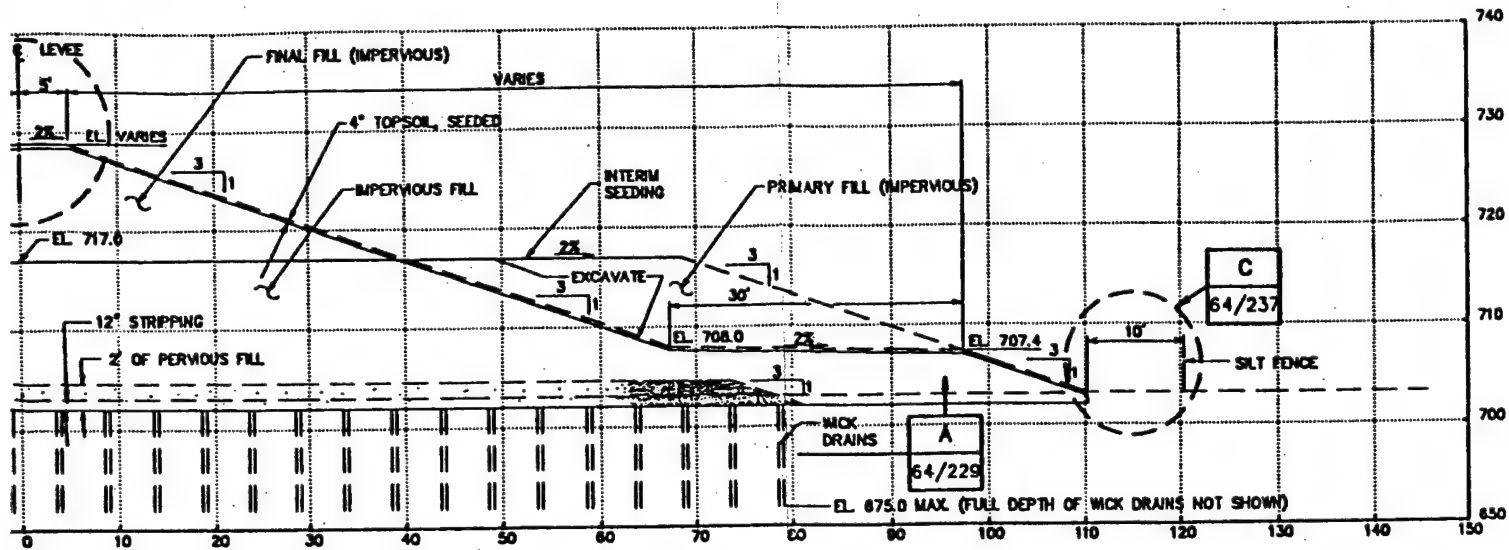


#### NOTES:

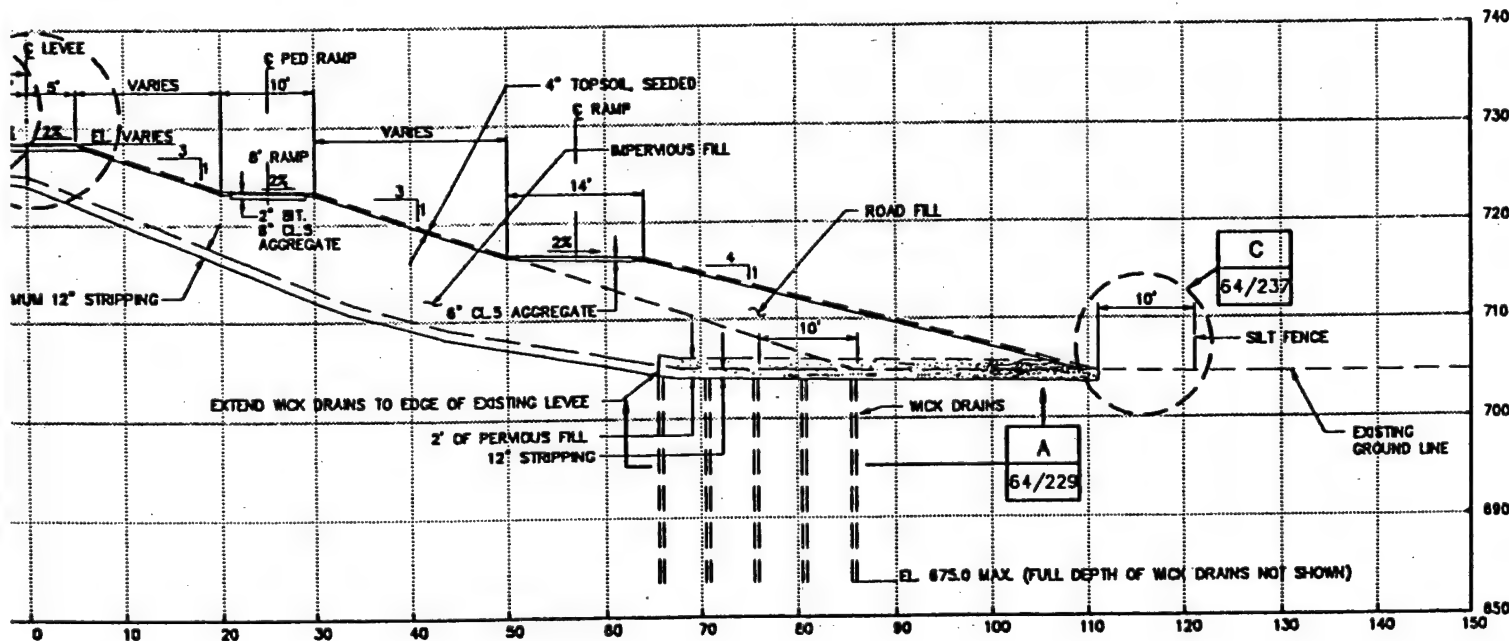
1. 8' PATH TIES INT
2. PLACE TEMPORAR LEVEE TO PROTECT

#### REFERENCES:

1. TEMPORARY EROS



SECTION 3  
TO STA. 28+85  
2A @ 21+50



SECTION 4  
TO STA. 32+00

EXISTING BRIDGE AT STA. 30+25±  
SILT FENCE AT THE TOP OF EXISTING  
EVER TREATMENT PLANT.

DWG. NO.

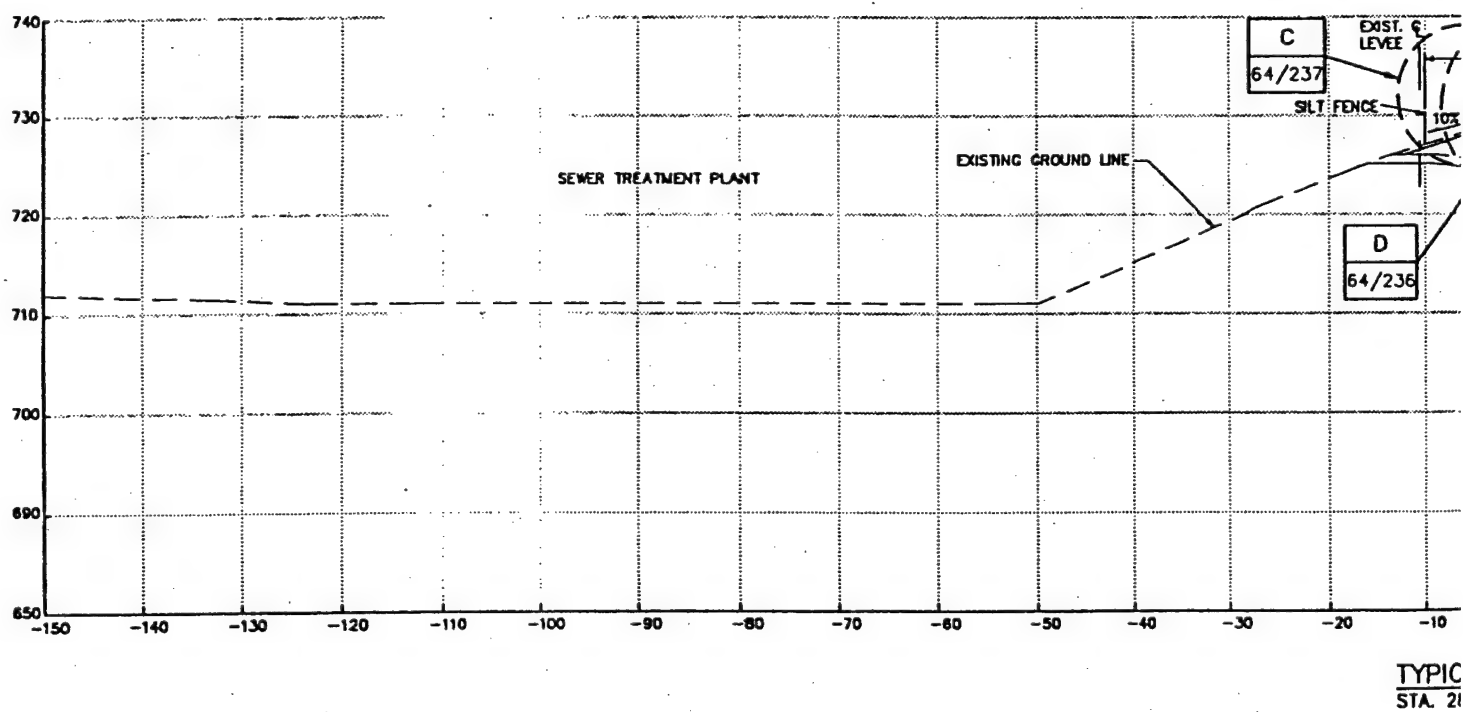
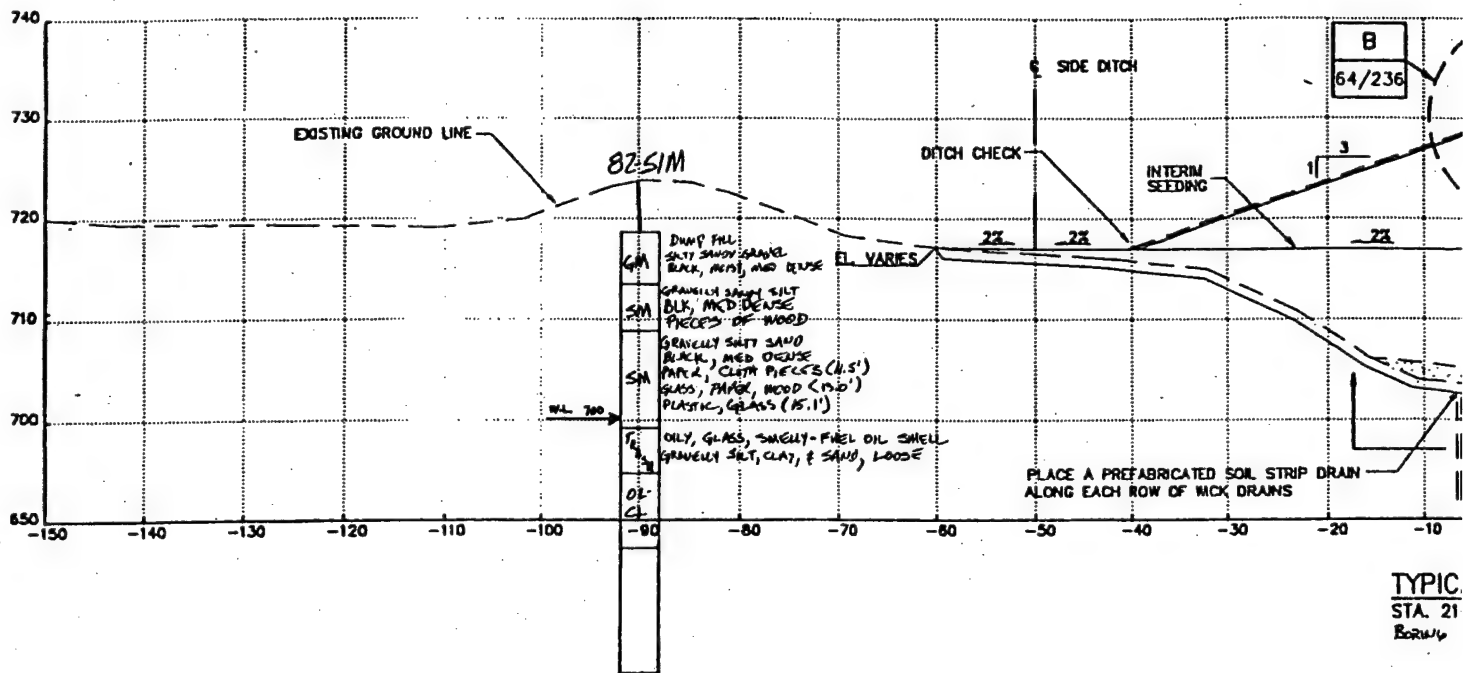
CONTROL DETAILS 64/237



2

FIGURE 35

SYMBOL	DESCRIPTION	DATE	APPROVAL
	PLANNING TRANSPORTATION ENGINEERING URBAN DESIGN		
DESIGNED: TJS		DEPARTMENT OF THE ARMY	
DRAWN: BOR		ST. PAUL DISTRICT, CORPS OF ENGINEERS	
CHECKED:		ST. PAUL, MINNESOTA	
SUBMITTED BY:		FLOOD CONTROL - MINNESOTA RIVER	
		CHASKA PROJECT CHASKA, MINNESOTA	
		CHASKA STAGE 4	

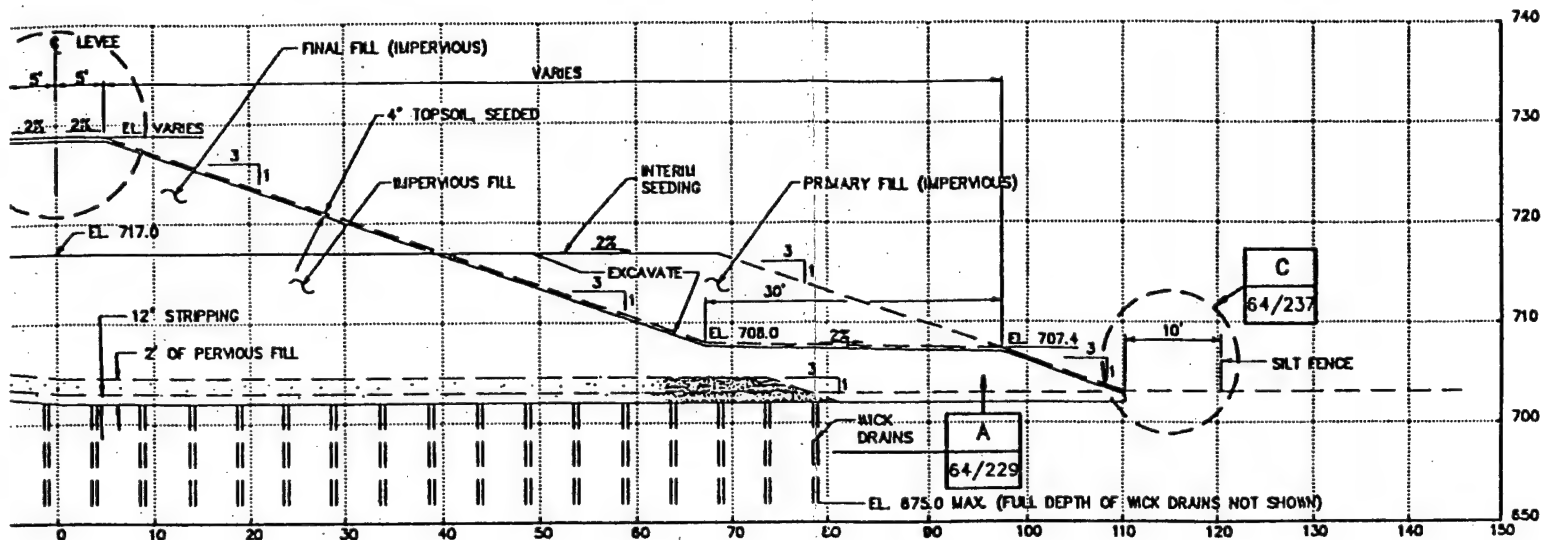


# NOTES:

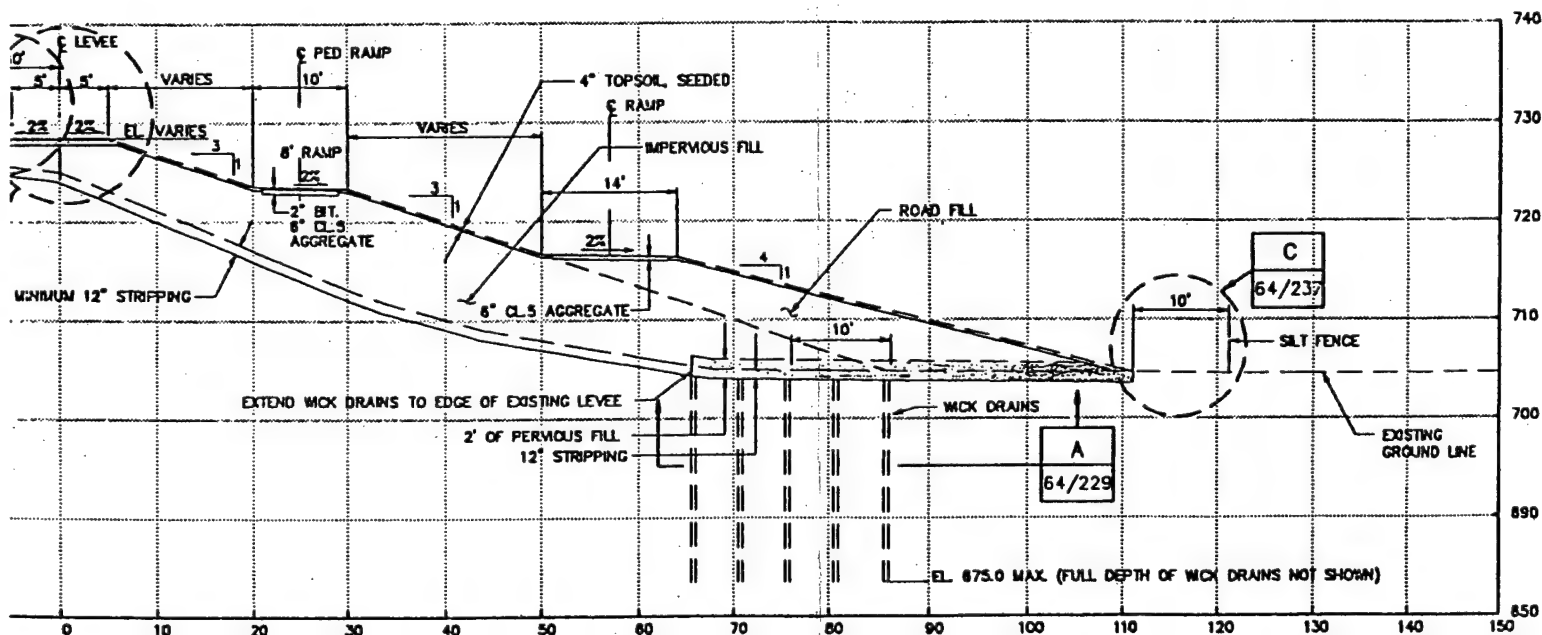
1. 8' PATH TIES IN
2. PLACE TEMPORA LEVEE TO PROTE

# REFERENCES

1. TEMPORARY ERC



AL SECTION 3  
00 TO STA. 28+85  
12-41M @ 23+80



AL SECTION 4  
+85 TO STA. 32+00

2

D EXISTING BRIDGE AT STA. 30+25  
Y SILT FENCE AT THE TOP OF EXISTING  
T SEWER TREATMENT PLANT.

DWG. NO.

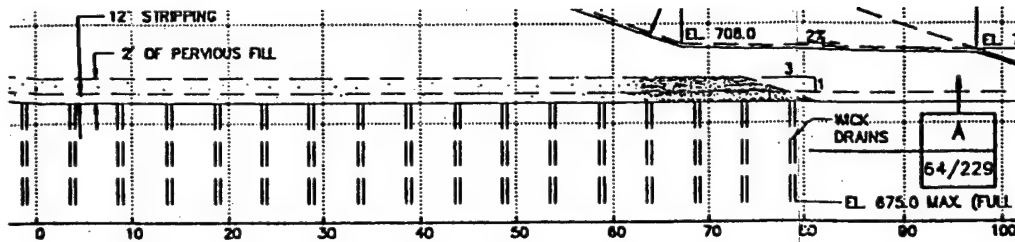
SON CONTROL DETAILS — — — — — 64/237



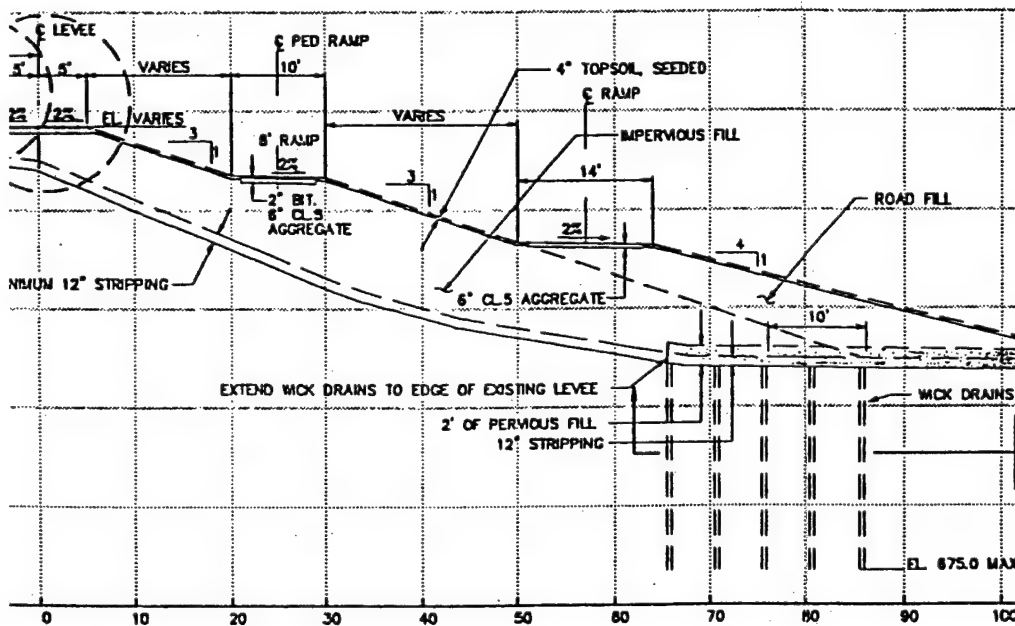
FIGURE 36

SYMBOL	DESCRIPTION	DATE	APPROVA
 <small>BRW INC. ENGINEERS, 700 THIRD STREET SOUTH, MINNEAPOLIS, MN 55401</small>	<small>PLANNING TRANSPORTATION ENGINEERING WEAR DESIGN</small>	<b>DEPARTMENT OF THE ARMY</b> <b>ST. PAUL DISTRICT, CORPS OF ENGINEERS</b> <b>ST. PAUL, MINNESOTA</b>	
DESIGNED: TJS	<b>FLOOD CONTROL — MINNESOTA RIVER</b> <b>CHASKA PROJECT CHASKA, MINNESOTA</b> <b>CHASKA STAGE 4</b> <small>CRANES &amp; LEVEES</small>		
DRAWN: IKR			
CHECKED:			
SUBMITTED BY:			





SECTION 3  
 TO STA. 28+85  
 64/222  
 64/229  
 STA. 26+50



SECTION 4  
 TO STA. 32+00  
 64/222  
 64/223

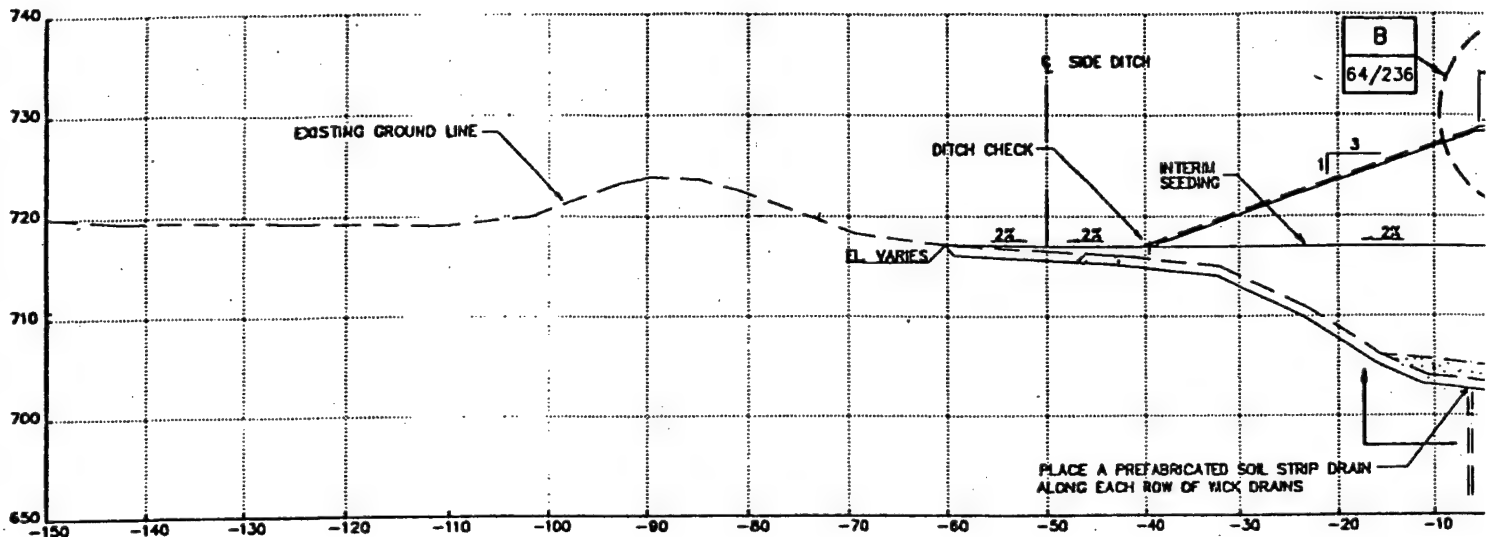
EXISTING BRIDGE AT STA. 30+25±  
 SILT FENCE AT THE TOP OF EXISTING  
 SEWER TREATMENT PLANT.

DWG. NO.

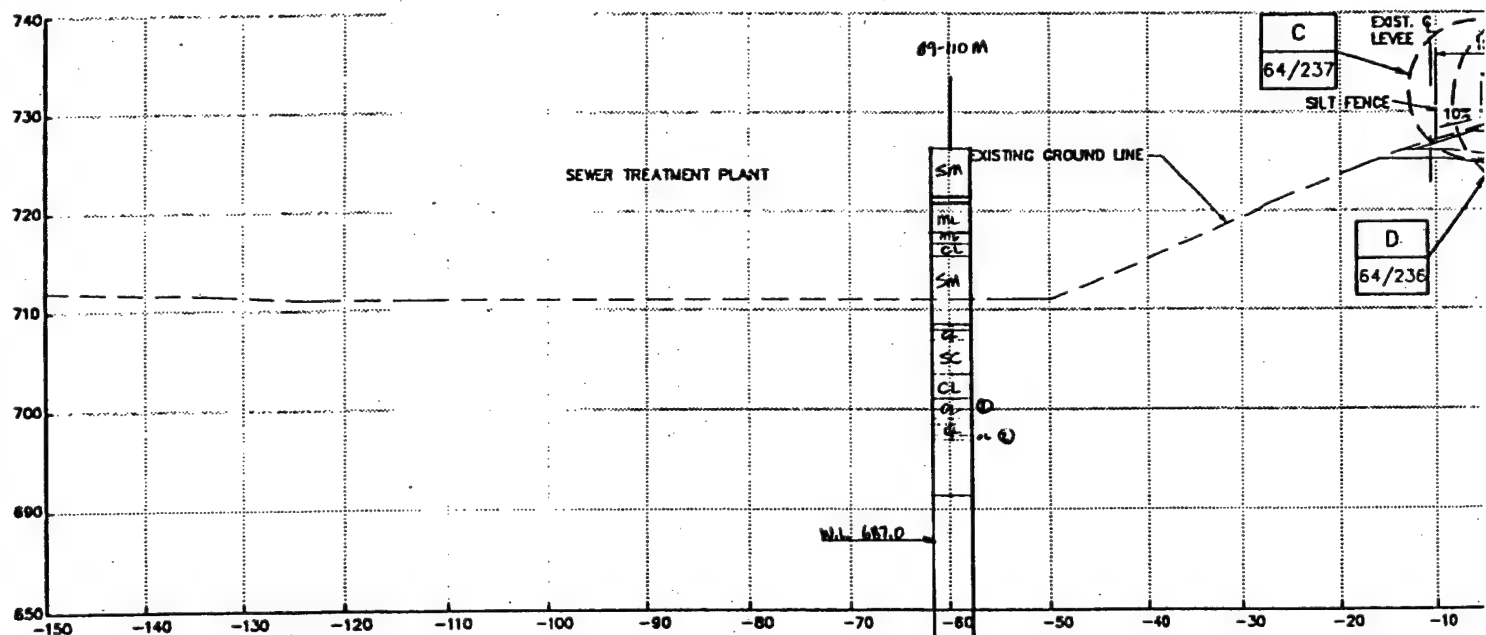
IN CONTROL DETAILS 64/237



SYMBOL	
BRW	
DESIGNED: TJS	
DRAWN: IKR	
CHECKED:	
SUBMITTED BY:	



TYPICAL  
STA. 21+



TYPICAL  
STA. 28-  
BORING 5

- ① SLURRY SOLVENT ODOOR
- ② FANIT SOLVENT ODOOR

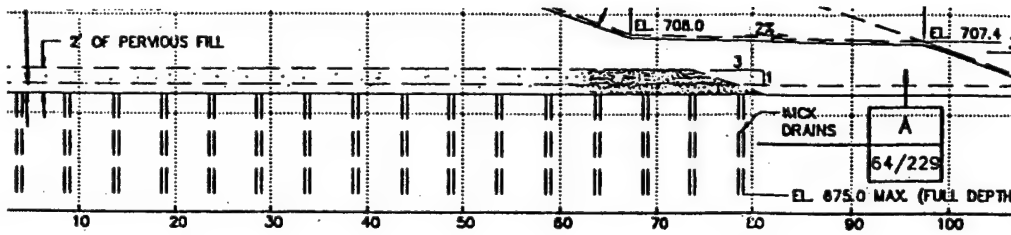
#### NOTES:

1. 8" PATH TIES INTO
2. PLACE TEMPORARY LEVEE TO PROTECT

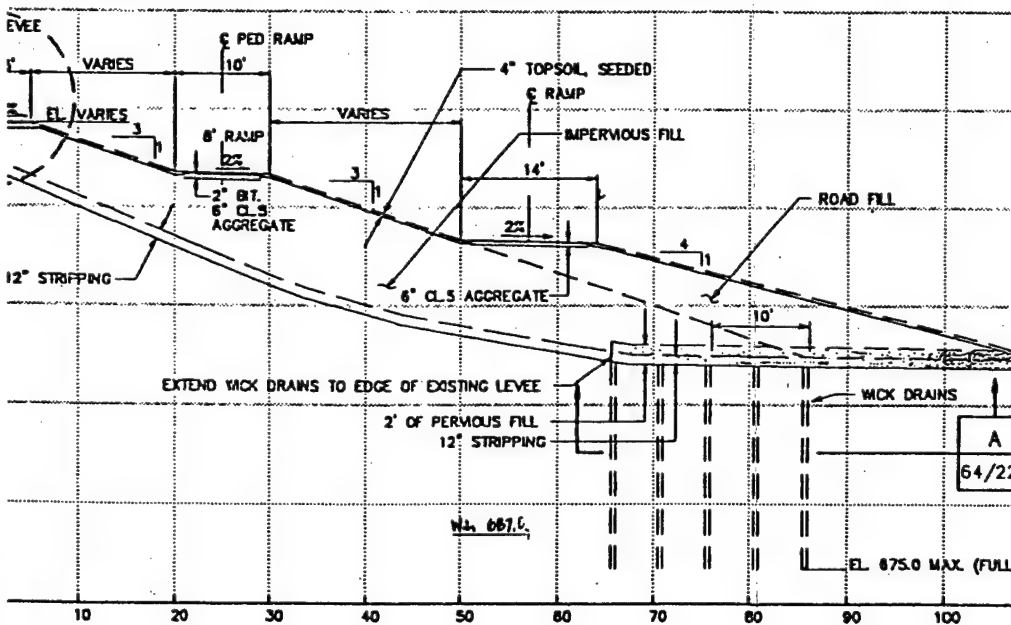
#### REFERENCES:

1. TEMPORARY EROSION





SECTION 3  
STA. 28+85 64/222



SECTION 4  
STA. 32+00 64/222  
@ STA 29+60 64/223

2

BRIDGE AT STA. 30+25±  
ICE AT THE TOP OF EXISTING  
TREATMENT PLANT.

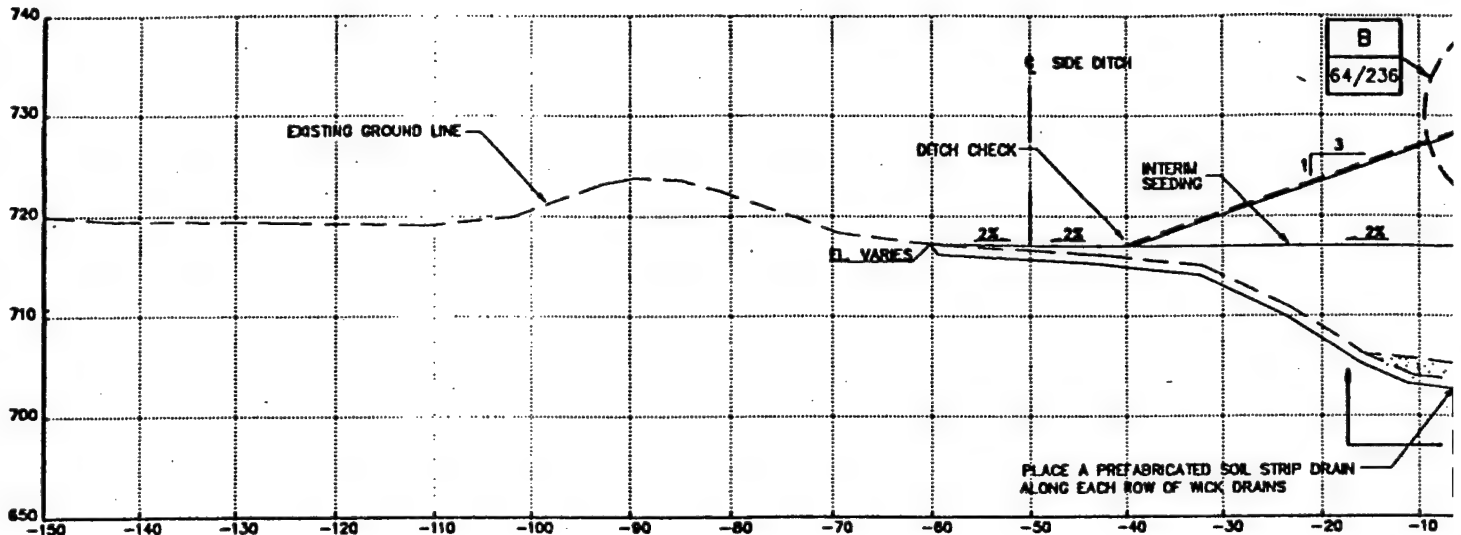
DWG. NO.

10L DETAILS — — — — — 64/237

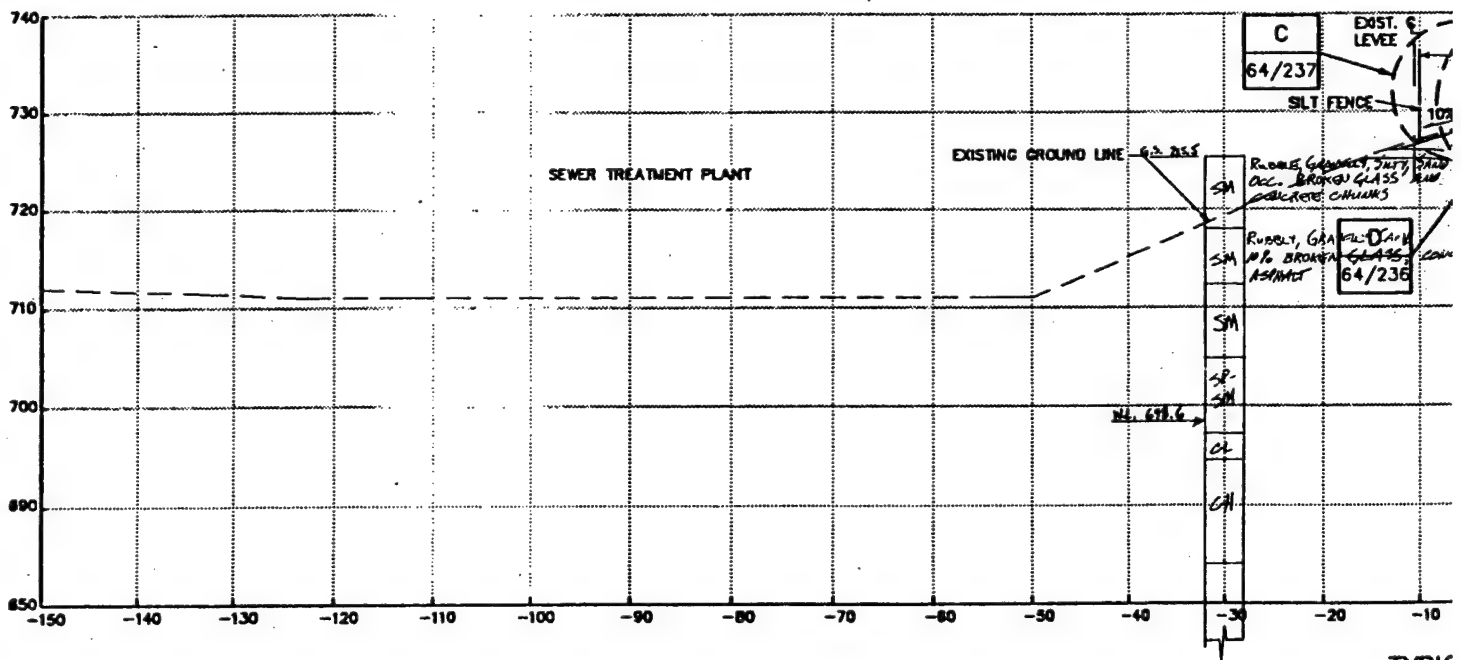


SYMBOL	
<div style="border: 1px solid black; padding: 2px; display: inline-block;"> <b>B R W</b> </div>	
DESIGNED: TJS	
DRAWN: IKR	
CHECKED:	
SUBMITTED BY:	

Ch



TYPIC  
STA. 21



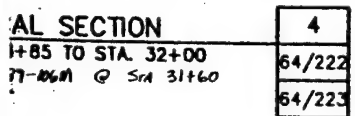
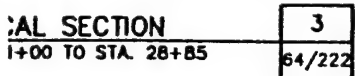
TYPIC  
STA. 2  
Boring

#### NOTES:

1. 8' PATH TIES IN
2. PLACE TEMPORARY LEVEE TO PROTECT


#### REFERENCES

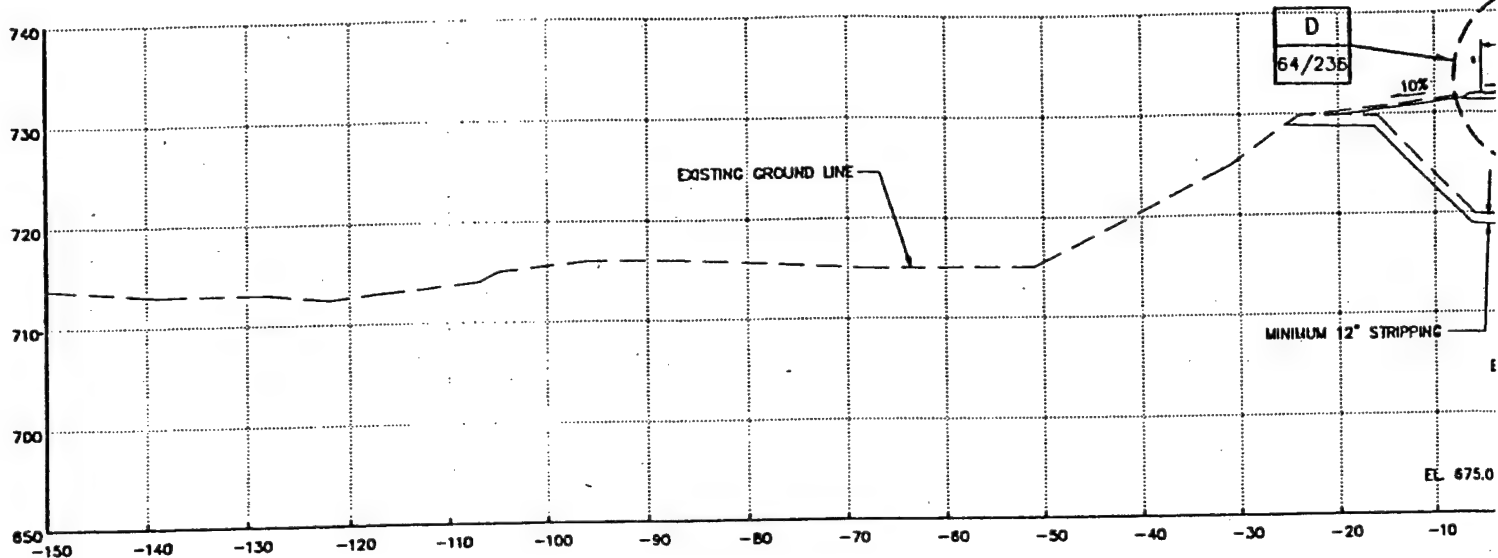
1. TEMPORARY EROSION CONTROL



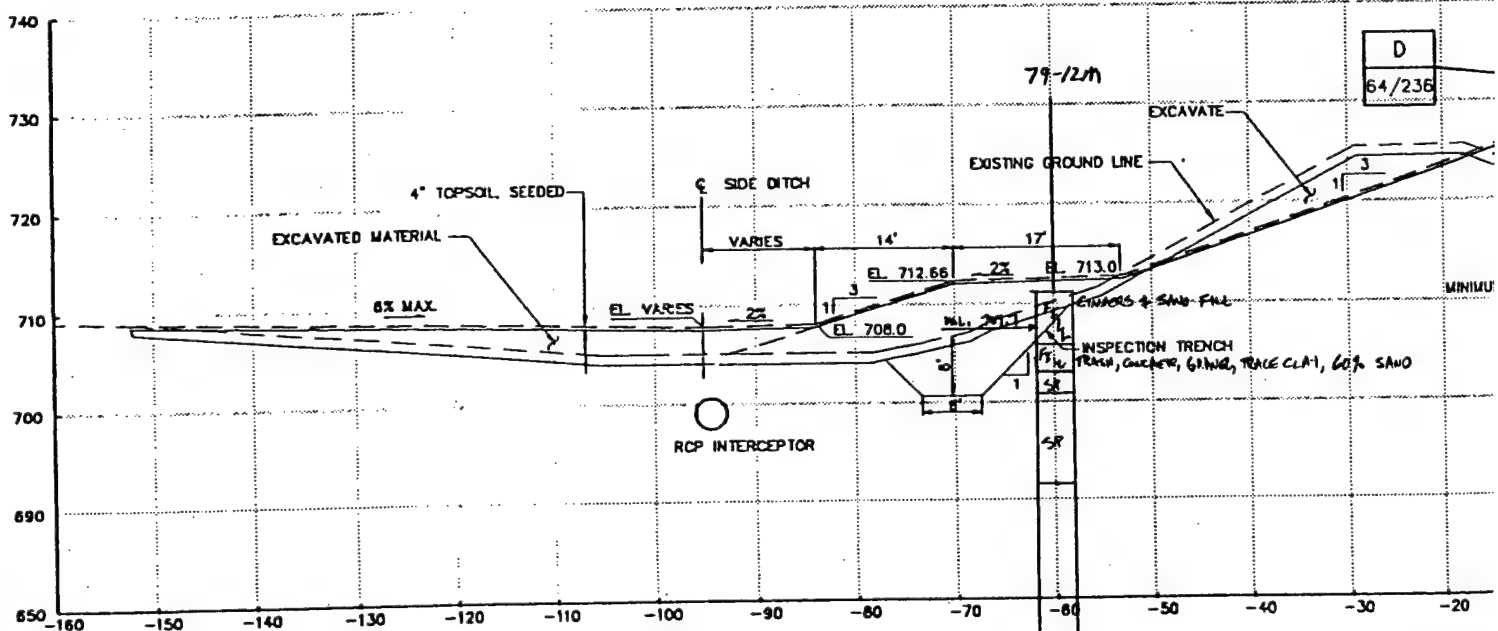
2



SYMBOL	
	
BRI INC. DEDHAM MA, 019	
DESIGNED: TJS	
DRAWN: MCR	
CHECKED: _____	
SUBMITTED BY: _____	



TYPICAL  
STA. 324



TYPICAL  
STA. 354  
BORAX 19

#### NOTES:

1. REFER TO INTER DITCH GRADES.

#### REFERENCES:

1. TEMPORARY EROSION CONTROL
2. EAST INTERCEPTOR

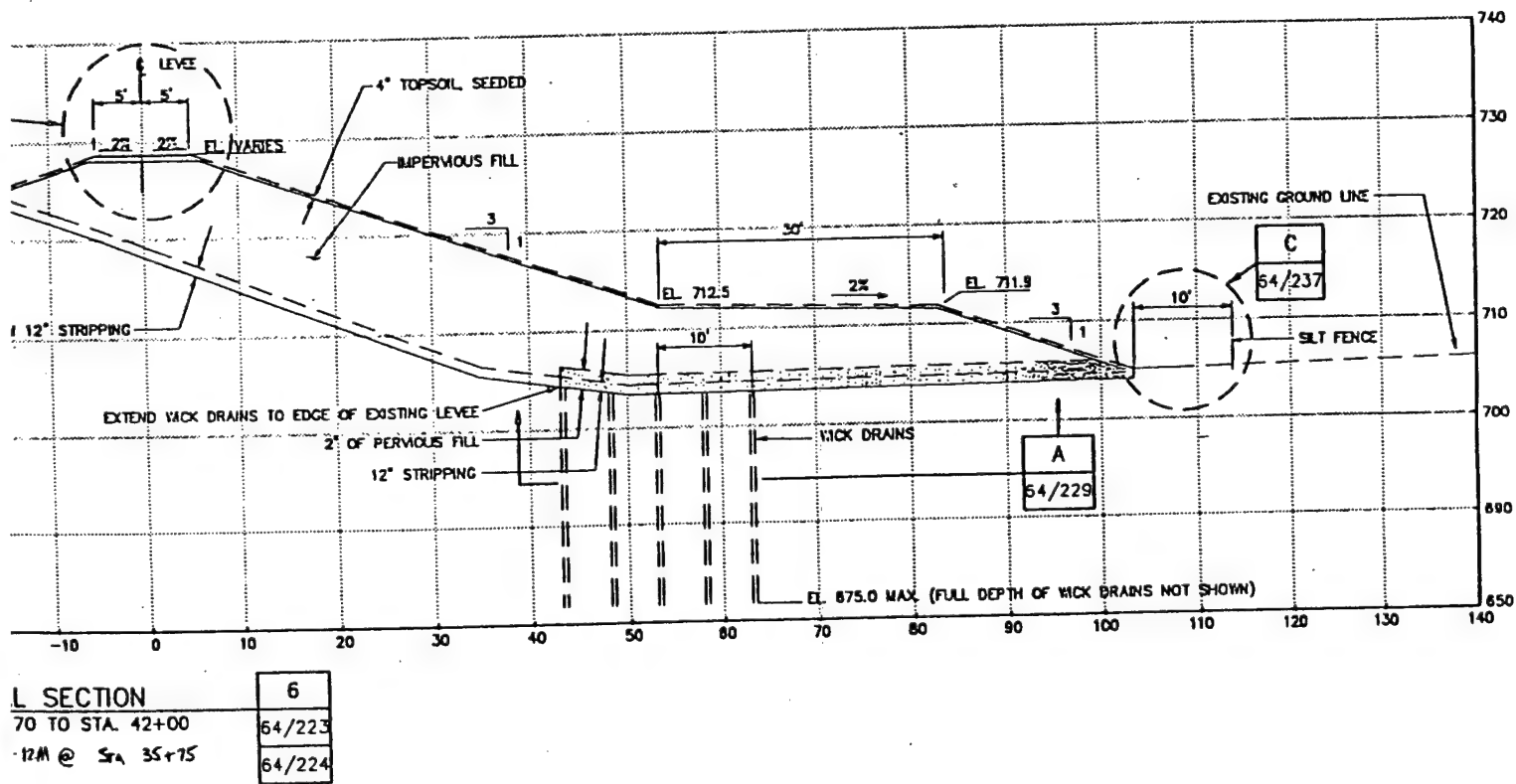
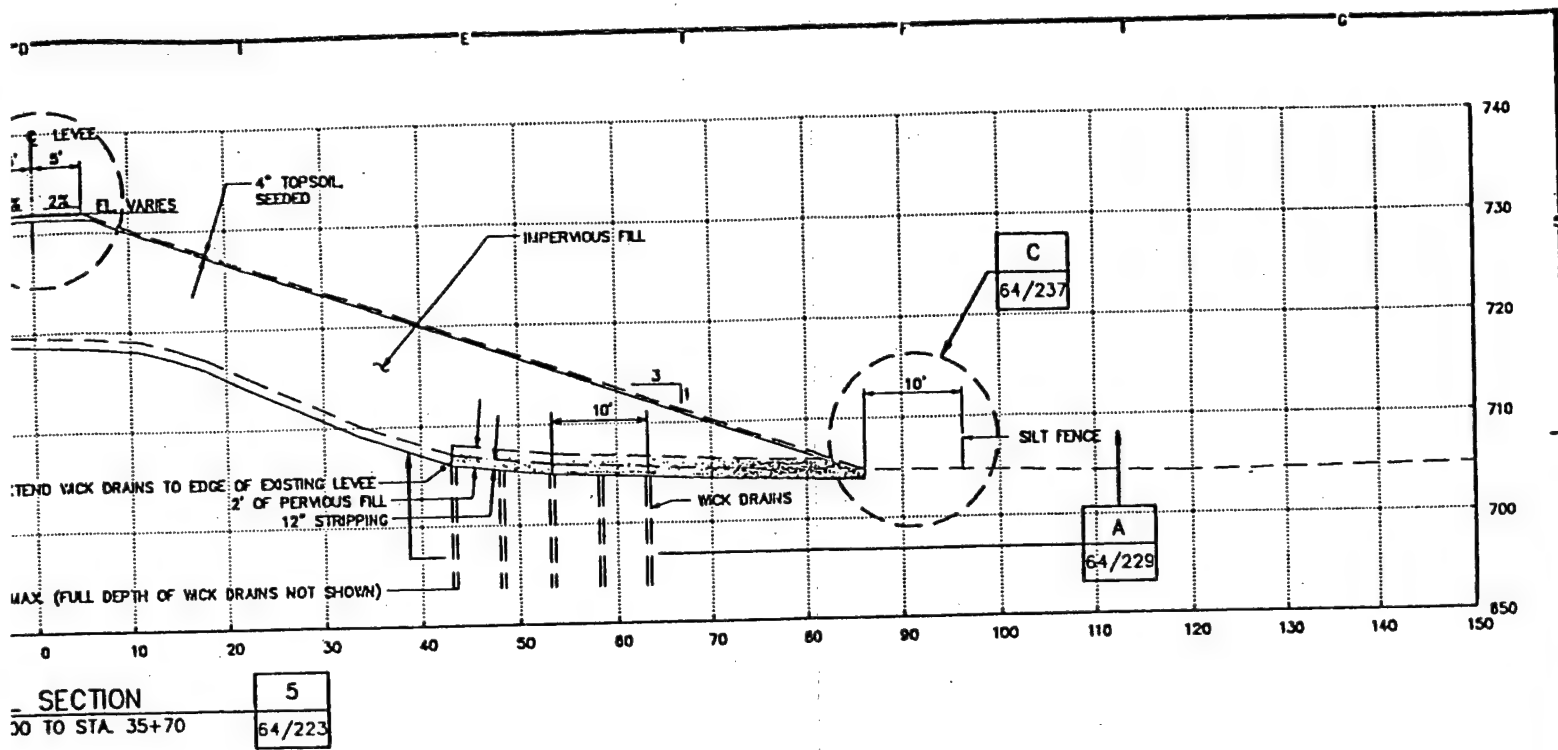


FIGURE 40

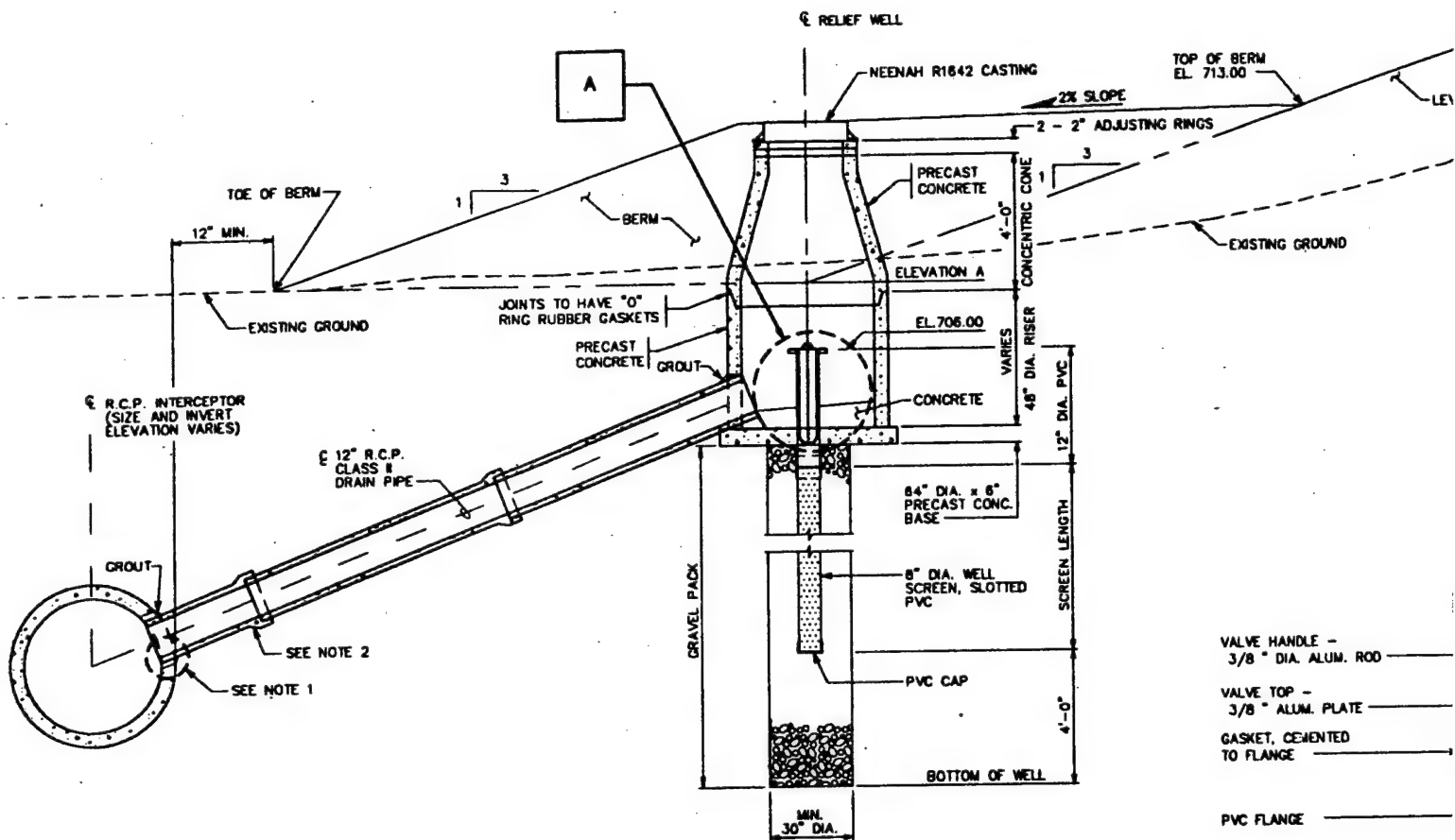
SEPTOR PIPE PROFILE SHEETS FOR SIDE

DWG. NO.

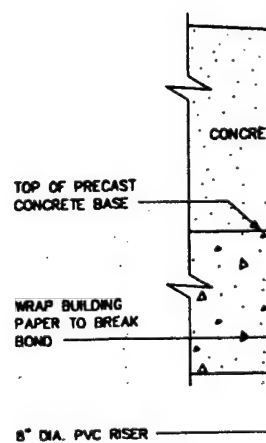
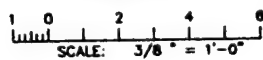
SIGN CONTROL DETAILS — 64/237  
OR PIPE — 64/255

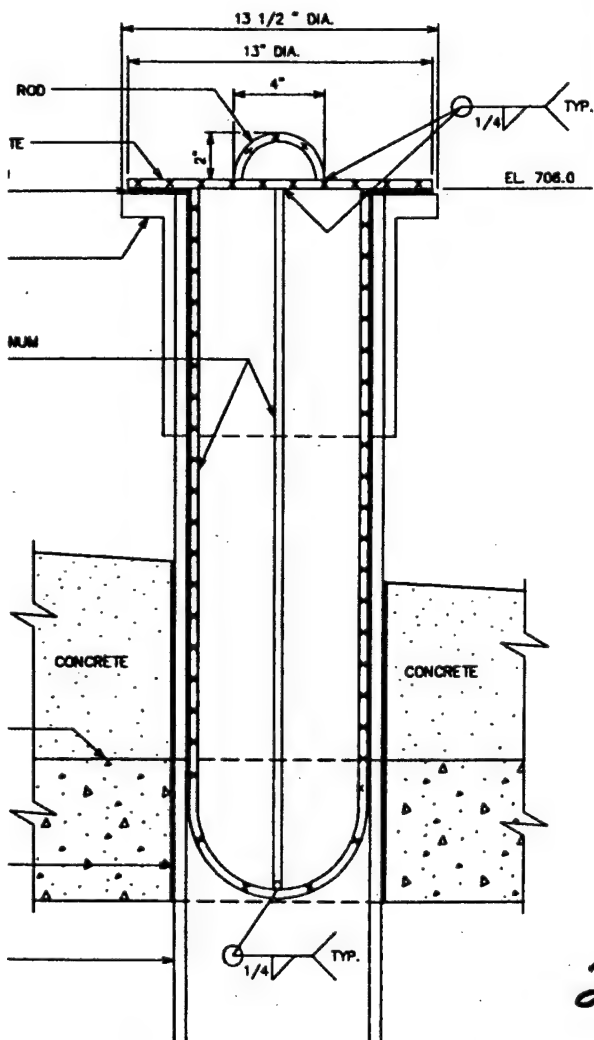


SYMBOL	DESCRIPTION	DATE	APPROVAL
	PLANNING TRANSPORTATION ENGINEERING URBAN DESIGN		
<p>DESIGNED: TJS DRAWN: IKR CHECKED: SUBMITTED BY:</p>			
<p>DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA</p>			
<p>FLOOD CONTROL - MINNESOTA RIVER CHASKA PROJECT - CHASKA, MINNESOTA CHASKA STAGE 4 DRAINAGE &amp; LEVEES</p>			

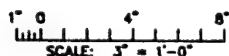


TYPICAL SECTION  
RELIEF WELL





**DETAIL**  
**VALVE & RISER TOP**



RELIEF WELL SCHEDULE							
WELL NO.	COORDINATES		LEVEE STA.	CASTING R/W ELEVATION	ELEVATION A	WELL SCREEN LENGTH (FT)	REMARKS
	X	Y					
RW-1	2103543.8230	650182.3283	60+68	712.76	709.00	10	
RW-2	2103668.8876	650258.1886	59+40	712.78	709.00	38	
RW-3	2103706.0863	650270.0033	59+00	712.78	709.00	38	
RW-4	2103775.6275	650295.8071	58+20	712.78	709.00	38	
RW-5	2103841.7196	650328.8043	57+40	712.78	709.00	38	
RW-6	2103911.4890	650367.9837	58+80	712.78	709.00	38	
RW-7	2103981.2330	650407.1370	55+80	712.78	709.00	39	
RW-8	2104088.1744	650460.5014	54+66.5	712.78	709.00	39	
RW-9	2104180.6974	650488.8573	53+92.5	712.78	709.00	39	
RW-10	2104232.2040	650513.7557	53+18.5	712.78	709.00	39	
RW-11	2104305.5899	650535.9383	52+44.5	712.78	709.00	39	
RW-12	2104378.5639	650554.8489	51+70.5	712.78	709.00	48	
RW-13	2104443.5173	650571.2820	51+03.5	712.78	709.00	48	
RW-14	2104508.4708	650587.7152	50+36.5	712.78	709.00	48	
RW-15	2104573.4316	650604.1192	49+69.5	712.78	709.00	48	
RW-16	2104638.3851	650620.5524	49+02.5	712.78	709.00	48	
RW-17	2104703.3308	650638.9855	48+35.5	712.78	709.00	60	
RW-18	2104748.7892	650648.4012	47+89.5	712.78	709.00	60	
RW-19	2104797.3697	650661.1149	47+43.5	712.70	708.00	60	
RW-20	2104847.6441	650667.2882	46+97.5	712.70	708.00	60	
RW-21	2104898.5313	650689.7126	46+51.5	712.70	708.00	60	
RW-22	2104945.7472	650669.3990	46+05.5	712.70	708.00	60	
RW-23	2104985.6130	650670.2043	45+59.5	712.70	708.00	60	
RW-24	2105021.6389	650678.2040	45+13.5	712.70	708.00	80	
RW-25	2105056.3430	650687.5571	44+67.5	712.70	708.00	60	
RW-26	2105091.2016	650705.0602	44+21.5	712.70	708.00	59	
RW-27	2105154.0196	650739.8329	43+49.7	712.70	708.00	59	
RW-28	2105217.2021	650774.7731	42+77.5	712.70	708.00	59	
RW-29	2105280.1951	650809.6426	42+05.5	712.70	708.00	59	
RW-30	2105343.2026	650844.4859	41+33.5	712.70	708.00	59	
RW-31	2105388.5032	650877.5716	40+61.5	712.70	708.00	59	
RW-32	2105428.6112	650917.7983	39+89.5	712.82	710.00	59	
RW-33	2105477.2479	651004.8521	38+87.5	712.82	710.00	59	
RW-34	2105526.7172	651093.8529	37+85.5	712.82	710.00	59	
RW-35	2105576.1953	651183.0624	36+83.5	712.82	710.00	59	
RW-36	2105625.8395	651272.1329	35+81.5	712.82	710.00	59	

**NOTES:**


1. DRAIN PIPES SHALL INTERSECT INTERCEPTOR AT 90°.
2. PRECAST CONCRETE TEE WITH 12" BELL SECTION MAY BE USED IN LIEU OF THIS DETAIL.

**REFERENCES:**

DWG. NO.

1. EAST/WEST INTERCEPTOR PIPE PROFILE \_ \_ \_ \_ \_ 64/255, 64/256  
2. LEVEE PLAN & PROFILE \_ \_ \_ \_ \_ 64/220, -/64/228

64/220 -  
FIGURE 4

SYMBOL		DESCRIPTION		DATE	APPROVAL
		PLANNING TRANSPORTATION ENGINEERING URBAN DESIGN		<b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA	
DESIGNED: TJS DRAWN: JAS CHECKED: MKM SUBMITTED BY: ED-0 ED-GH					
DATE: 07-29-92		CAD FILE NAME: RELIEF.DWG		DRAINING NUMBER: <b>M34-CH-R-84/254</b>	
SPEC NO:		FLOOD CONTROL - MINNESOTA RIVER CHASKA PROJECT CHASKA, MINNESOTA <b>CHASKA STAGE 4</b> INTERIOR DRAINAGE RELIEF WELLS SECTIONS AND SCHEDULE		SHT 55 OF 119	



## APPENDIX B

DRILLING LOG		DIVISION		INSTALLATION		Hole No. 73-2M	
PROJECT		LOCATION (Coordinates or Station)		SIZE AND TYPE OF BIT		SHEET 1 OF 6 SHEETS	
CHASKA		650,800 N 2, 106,600 E		1 3/8" X 2" Sampler			
3. DRILLING AGENCY		4. HOLE NO. (As shown on drawing title and file number)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)		12. MANUFACTURER'S DESIGNATION OF DRILL	
Geotechnical Engineering		73-2M		MSL		Central Mines	
5. NAME OF DRILLER		6. DIRECTION OF HOLE		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		14. TOTAL NUMBER CORE BOXES	
Ocl Johnston		<input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		14		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		8. DEPTH DRILLED INTO ROCK		16. DATE HOLE		17. ELEVATION TOP OF HOLE	
				3/1/73		701.5 Est. from Topog.	
9. TOTAL DEPTH OF HOLE		10. SIGNATURE OF INSPECTOR		18. TOTAL CORE RECOVERY FOR BORING		19. SIGNATURE OF INSPECTOR	
52.0		R.D. Johnston		not Applicable			

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
701.5	0.0	c	d	e	f	g
700.5	1.0		ICE			Note: 1. Elevations estimated from topog. 2. No duplicate samples taken 3. Boring drilled with 1 3/8" X 2" Sampler driven with a 140 lb hammer falling 30". Sampler was driven 2.5'. Blow count recorded for top 1.5' of each drive. 4. Cleaned out after each drive with hollow-stem auger.
	2.0		SILTY CLAY (CH-OH) VERY SOFT HIGH PLASTICITY ORGANIC DK. GRAY	2.5		
	3.0		1. Snail shells present 2. Has odor	2.5		
	4.0		0.2 seam med. sand	3.0		
697.5	4.0		SILTY CLAY (CH-OH) SOFT HIGH PLASTICITY WET DK. GRAY	3.5		
	5.0		1. Occasional thin sand strata (0.1') present.	3.5		
	6.0		3. Organic content varies. Some highly organic seams up to 0.3' thick	3.5		
	7.0		4. Calcareous	3.5		
	8.0		5. Snail shells present.	3.5		
	9.0		Recent Alluvium	3.5		
	10.0			3.5		

DRILLING LOG		DIVISION <i>ALD</i>	INSTALLATION <i>St. Paul Dist</i>	Hole No. <i>73-2M</i>	SHEET <i>2</i> OF 6 SHEETS
1. PROJECT <i>CHASKA</i>			10. SIZE AND TYPE OF BIT		
2. LOCATION (Coordinates or Station)			11. DATUM FOR ELEVATION SHOWN (TBM or MSL)		
3. DRILLING AGENCY			12. MANUFACTURER'S DESIGNATION OF DRILL		
4. HOLE NO. (As shown on drawing title and file number) <i>73-2M</i>			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		
5. NAME OF DRILLER			14. TOTAL NUMBER CORE BOXES		
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER		
7. THICKNESS OF OVERBURDEN			16. DATE HOLE		
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE <i>701.5</i>		
9. TOTAL DEPTH OF HOLE			18. TOTAL CORE RECOVERY FOR BORING		
			19. SIGNATURE OF INSPECTOR		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV- ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
691.5	10.0					
	11.0		SILTY CLAY (CH-SH)	10.5	W. H. 5#4 Jar 10.5 TO 11.0	
	12.0		SOFT HIGH PLASTICITY WET DK. GRAY	12.0	1	
	13.0		(see page 1 for supplemental descrip- tion.)	13.0	1	5#5 Jar 13.0 TO 13.5
	14.0		Recent Alluvium	14.5	1	
	15.0			15.5	1	
	16.0			16.0	1	
	17.0			17.0	1	
	18.0			18.0	1	5#6 Jar 18.0 TO 18.5
	19.0			19.0	1	
	20.0					

DRILLING LOG		DIVISION		INSTALLATION		SHEET 3 OF 10 SHEETS	
1. PROJECT <i>CHASKA</i>				10. SIZE AND TYPE OF BIT			
2. LOCATION (Coordinates or Station)				11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
3. DRILLING AGENCY				12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number) <i>73-2M</i>				13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED UNDISTURBED	
5. NAME OF DRILLER				14. TOTAL NUMBER CORE BOXES			
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.				15. DATE HOLE		STARTED COMPLETED	
7. THICKNESS OF OVERBURDEN				16. ELEVATION TOP OF HOLE			
8. DEPTH DRILLED INTO ROCK				17. TOTAL CORE RECOVERY FOR BORING %			
9. TOTAL DEPTH OF HOLE				18. SIGNATURE OF INSPECTOR			
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)	
681.5	20.0	c					
	21.0		SILTY CLAY (CH-OH)	1			
	22.0		SOFT HIGH PLASTICITY WET DK. GRAY	1			
	23.0		(see page 1 for Supplemental notes)	1			
	24.0		Recent Alluvium	1			
976.5	25.0		SANDY GRAVELLY CLAY (CH)	23			
975.8	25.7		BROWN - GRAY	10			
	26.0		CLAYEY SILT MED. DENSE (ML-CL)	12			
	27.0		LOW PLASTICITY MOIST-WET GRAY-BROWN MOTTLED	8			
	28.0		very Calcareous	8			
	29.0			2			
	30.0						

DRILLING LOG		DIVISION	INSTALLATION		Hole No. 73-2M	SHEET 4 OF 8 SHEETS
1. PROJECT <b>CHASKA</b>			10. SIZE AND TYPE OF BIT			
2. LOCATION (Coordinates or Station)			11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
3. DRILLING AGENCY			12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number) <b>73-2M</b>			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED    UNDISTURBED	
5. NAME OF DRILLER			14. TOTAL NUMBER CORE BOXES			
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER			
7. THICKNESS OF OVERBURDEN			16. DATE HOLE		STARTED    COMPLETED	
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE <b>701.5</b>			
9. TOTAL DEPTH OF HOLE			18. TOTAL CORE RECOVERY FOR BORING %			
			19. SIGNATURE OF INSPECTOR			

ELEVATION 671.5	DEPTH 30.0	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			CLAYEY SILT MED DENSE (ML-CL) 30.5	4		
			Low PLASTICITY 31.0	12		
	31.0		MOIST-WET GRAY-BROWN MOTTLED			
	32.0		Very Calcareous 32.0	549	JAR	
				12	32.5	
				18	33.5	
	33.0					
969.10	33.5			21		
	34.0		SILTY CLAY (CH) VERY STIFF MED. PLAST. 34.5		5410	
			MOIST GRAY 35.0	11	34.5 TO 35.0	Represents Clay
	35.0		Stratified with clayey silt (ML) med. dense low to non plastic saturated gray	8	5411	
	36.0			12	JAR 35.0 TO 36.0	Representative of clayey silt strata
	37.0		Strata vary from 0.1' to 0.4' thick 37.0	7		
963.0	37.5					
	38.0		SILTY CLAY (CH) WITH SILT LAMINAE 38.0	9	5412	
			VERY STIFF MOIST GRAY	12	JAR 38.0 TO 38.5	
	39.0		1. Calcareous 2. Occasional thin (0.1'-0.3') Sandy Strata. 39.5	8		
	40.0					

DRILLING LOG		DIVISION	INSTALLATION		SHEET	
1. PROJECT		NCD	ST. Paul Ditch		5 OF 6 SHEETS	
CHASKA			10. SIZE AND TYPE OF BIT			
2. LOCATION (Coordinates or Station)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)				
3. DRILLING AGENCY		12. MANUFACTURER'S DESIGNATION OF DRILL				
4. HOLE NO. (As shown on drawing title and file number)		73-2M		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		
5. NAME OF DRILLER				14. TOTAL NUMBER CORE BOXES		
6. DIRECTION OF HOLE				15. ELEVATION GROUND WATER		
<input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.				16. DATE HOLE		
7. THICKNESS OF OVERBURDEN				17. ELEVATION TOP OF HOLE		701.5
8. DEPTH DRILLED INTO ROCK				18. TOTAL CORE RECOVERY FOR BORING		%
9. TOTAL DEPTH OF HOLE				19. SIGNATURE OF INSPECTOR		
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
661.5	400					
	410		SILTY CLAY WITH SILT LAMINAE	9		
	420		VERY STIFF MOIST GRAY	14		
	430		1. Calcareous	4		
	440		2. Occasional Thin (0.1'-0.3') Sandy Strata	8		
	450		3. Appears more lacustrine than fluvial in origin.	10		
	460			5		
	470			8		
	480			15		
	490			5		
	500			9		
	510			13		
	520			11		

DRILLING LOG		DIVISION	INSTALLATION	Hole No. <u>13-2M</u>		SHEET <u>6</u> OF <u>6</u> SHEETS
1. PROJECT <u>CHASKA</u>			10. SIZE AND TYPE OF BIT			
2. LOCATION (Coordinates or Station)			11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
3. DRILLING AGENCY			12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number) <u>73-2M</u>			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED <input type="checkbox"/> UNDISTURBED <input type="checkbox"/>	
5. NAME OF DRILLER			14. TOTAL NUMBER CORE BOXES			
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER			
7. THICKNESS OF OVERBURDEN			16. DATE HOLE		STARTED _____ COMPLETED _____	
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE <u>701.5</u>			
9. TOTAL DEPTH OF HOLE			18. TOTAL CORE RECOVERY FOR BORING %			
			19. SIGNATURE OF INSPECTOR			
ELEVATION <u>654.5</u>	DEPTH <u>50.0</u>	LEGEND <u>c</u>	CLASSIFICATION OF MATERIALS (Description) <u>d</u>	% CORE RECOV- ERY <u>e</u>	BOX OR SAMPLE NO. <u>f</u>	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) <u>g</u>
			SILTY CLAY (CH) WITH SILT LAMINAE VERY STIFF MOIST GRAY 1. Calcareous 2. Occasional thin (0.1'-0.3') sandy strata.	13		
	51.0			23		
64 9.5	52.0		BOTTOM OF HOLE			
	53.0					
	54.0					
	55.0					
	56.0					
	57.0					
	58.0					
	59.0					
	60.0					



DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS
PROJECT		NCD.	ST. Paul DISTRICT	
LOCATION (Coordinate or Station)		250E	79-12M	
DRILLING AGENCY		250E	79-12M	
HOLE NO. (As shown on drawing title and file number)		79-12M		
NAME OF DRILLER		SCAMISTANECAT		
DIRECTION OF HOLE		VERTICAL <input checked="" type="checkbox"/> INCLINED <input type="checkbox"/> DEG. FROM VERT.		
THICKNESS OF OVERBURDEN				
DEPTH DRILLED INTO ROCK				
TOTAL DEPTH OF HOLE		55'		
SIZE AND TYPE OF BIT		3" ROLLER BIT		
DAYUM FOR ELEVATION SHOWN (TBM & MSL)		MSL		
MANUFACTURER'S DESIGNATION OF DRILL		CME 750		
TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		16		
TOTAL NUMBER CORE BOXES				
ELEVATION GROUND WATER		3.5 (707.7)		
DATE HOLE		STARTED 5-4-79 COMPLETED 5-4-79		
ELEVATION TOP OF HOLE		711.2		
TOTAL CORE RECOVERY FOR BORING				
SIGNATURE OF INSPECTOR		K. Harmon		

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
711.2					2424	1401B HAMMER 30" DROP 6" hollow stem 3" ROLLER BIT + DRILL MUD 2" x 2 1/2" x 3' BL 0-3'
	1	F	CINDERS + SAND Sill		2425	
	2	L			2426	
	3	L			2427	
	4	L			2428	
	5	L			2429	
	6	L			2430	
	7	L			2431	
	8	L			2432	
	9	L			2433	
	10	L			2434	
	11	L			2435	
	12	L			2436	
	13	L			2437	
	14	L			2438	
	15	L			2439	
	16	L			2440	
	17	L			2441	
	18	L			2442	
	19	L			2443	
	20	L			2444	
	21	L			2445	
	22	L			2446	
	23	L			2447	
	24	L			2448	
	25	L			2449	
	26	L			2450	
	27	L			2451	
	28	L			2452	
	29	L			2453	
	30	L			2454	
	31	L			2455	
	32	L			2456	
	33	L			2457	
	34	L			2458	
	35	L			2459	
	36	L			2460	
	37	L			2461	
	38	L			2462	
	39	L			2463	
	40	L			2464	
	41	L			2465	
	42	L			2466	
	43	L			2467	
	44	L			2468	
	45	L			2469	
	46	L			2470	
	47	L			2471	
	48	L			2472	
	49	L			2473	
	50	L			2474	
	51	L			2475	
	52	L			2476	
	53	L			2477	
	54	L			2478	
	55	L			2479	
	56	L			2480	
	57	L			2481	
	58	L			2482	
	59	L			2483	
	60	L			2484	
	61	L			2485	
	62	L			2486	
	63	L			2487	
	64	L			2488	
	65	L			2489	
	66	L			2490	
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	70	L			2494	
	71	L			2495	
	72	L			2496	
	73	L			2497	
	74	L			2498	
	75	L			2499	
	76	L			2500	
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	90	L			2514	
	91	L			2515	
	92	L			2516	
	93	L			2517	
	94	L			2518	
	95	L			2519	
	96	L			2520	
	97	L			2521	
	98	L			2522	
	99	L			2523	
	100	L			2524	

DIVISION		INSTALLATION		SHEET	
DRILLING LOG		ST. Paul DISTRICT		2	
1. PROJECT		10. SIZE AND TYPE OF BIT			
CHASKA PIKE		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
2. LOCATION (Coordinates or Station)		12. MANUFACTURER'S DESIGNATION OF DRILL			
3. DRILLING AGENCY		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN			
4. HOLE NO. (As shown on drawing title and file number)		DISTURBED		UNDISTURBED	
79-12m					
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES			
6. DIRECTION OF HOLE		15. ELEVATION GROUND WATER			
<input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		16. DATE HOLE		STARTED	
				COMPLETED	
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE			
8. DEPTH DRILLED INTO ROCK		711.2			
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING			
		19. SIGNATURE OF INSPECTOR			
		K. Herman			

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
706.2	10				2X2 1/2	
701.0	10.2				HYD	
	11	SP	LT. BROWN FINE TO COARSE SAND MED DENSE SATURATED	57 4 1/2	WITH	NOTE WENT TO MUD + ROLLER BIT 15' 2" x 2 1/2" DRIVE 10-13. Sample 4 11'-12' JAR.
	12				PUSHED	
	13			P-3 R-3.0	PUSHED	ROT 13
697.7	13.5				STD 6	STD DRIVE 13'-15'
	14	SP	LT. BROWN MED SAND MED DENSE SATURATED	57 5 13.5 14.5	9	
	15			D-2 R-1.7	10	Sample 5 13.5-14.5 JAR.
	16				2X2 1/2	2" x 2 1/2" DRIVE 15'-18'
695.0	16.2				HYD	
	17	SP	LT. BROWN FINE SAND MED DENSE SATURATED	57 6 16.2 17	WITH	Sample 6 16.2-17.0 JAR.
	18			P-3 R-2.2	PUSHED	ROT 18
692.7	18.5				STD 9	STD DRIVE 18'-20'
	19	SP	LT. BR MED TO FINE SAND MED DENSE SATURATED	57 7 18.5 19.5	11	Sample 7 18.5-19.5
	20			D-2 R-1.8	13	ROT 20

DRILLING LOG		DIVISION		INSTALLATION		Hole No. <u>79-12M</u>	
PROJECT		LOCATION (Coordinates or Station)		ST. Paul DISTRICT		SHEET <u>3</u> OF SHEETS	
1. PROJECT <u>CHASKE PINE</u>				10. SIZE AND TYPE OF BIT			
2. LOCATION (Coordinates or Station)				11. DATUM FOR ELEVATION SHOWN (TBM or BSL)			
3. DRILLING AGENCY				12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number) <u>79-12M</u>				13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		13. DISTURBED	
5. NAME OF DRILLER				14. TOTAL NUMBER CORE BOXES		15. ELEVATION GROUND WATER	
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.				16. DATE HOLE		16. STARTED	
7. THICKNESS OF OVERBURDEN				17. ELEVATION TOP OF HOLE <u>711.2</u>		18. TOTAL CORE RECOVERY FOR BORING	
8. DEPTH DRILLED INTO ROCK				19. SIGNATURE OF INSPECTOR <u>K. Harmon</u>		19. COMPLETED	
9. TOTAL DEPTH OF HOLE							

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
491.1	10.1		LT. DR		2X22	2" x 2 1/2" DRIVE
			COARSE TO MCT SAND		8	20'-23'
	21	SP	M. DENSE WET SOME GRAVEL	STF	21/22	Sample 8 21'-22' JAN
	22				19	
	23	SP	SAND	D-3 R-2	27	13-T 23
	24				5	STD DRIVE 23'-25'
	25				8	(26)
	26				12	
	27	SP			13	ROT 25
	28				2X22	2" x 2 1/2" DRIVE
	29				8	Sample 9 26'-27' JAN
	30	SP		STF	26/27	
					13	
				D-3 R-24	28	ROT 28
					5	STD DRIVE 28'-30'
					8	(19)
					12	
681.2	30					ROT 30

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>		<b>SHEET</b>	
1. PROJECT <b>CHASKA DIKE</b>				<b>ST. Paul DISTRICT</b>		<b>2</b>	
2. LOCATION (Coordinates or Station)				10. SIZE AND TYPE OF BIT		OF SHEETS	
3. DRILLING AGENCY				11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
4. HOLE NO. (As shown on drawing title and file number)		<b>79-12M</b>		12. MANUFACTURER'S DESIGNATION OF DRILL			
5. NAME OF DRILLER				13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED UNDISTURBED	
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.				14. TOTAL NUMBER CORE BOXES			
7. THICKNESS OF OVERBURDEN				15. ELEVATION GROUND WATER			
8. DEPTH DRILLED INTO ROCK				16. DATE HOLE		STARTED COMPLETED	
9. TOTAL DEPTH OF HOLE				17. ELEVATION TOP OF HOLE <b>711.2</b>			
				18. TOTAL CORE RECOVERY FOR BORING			
				19. SIGNATURE OF INSPECTOR <b>K. Harmon</b>			

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
681.2 30.1					2x2 1/2	
681.1	31	SP	LT. BR MED SAND M. DENCE WET	57.10 31.32	17	2"x2 1/2" DIA VBS 20-33'
	32					
	33					
	34	SP				
676.6 24.6						
	35	SP	LT. BR FINE SAND M. DENCE WET	57.10 34.6 34.9	27	Sample 10 31'-32' JAR
675.3 38.9						
675.0 36.2		ML	LAYER SANDY SILT			
	37					
	38	SP	LT. BR MED SAND M. DENCE WET SOME GRAVEL	57.12 36.2 37	29	Sample 11 34.6-34.9 JAR
672.7 38.5						
	39	SP	LT. BR MED TO COARSE SAND M. DENCE WET	57.13 39.40	48	Sample 12 36.2-37' JAR
671.2 40						
	40					

Hole No. 79-122

<b>DRILLING LOG</b>		<b>DIVISION</b>	<b>INSTALLATION</b>	<b>SHEET</b>
1. PROJECT <i>CHASKA PILE</i>			<i>ST. Paul DISTRICT</i>	OF SHEETS
2. LOCATION (Coordinate or Station)		10. SIZE AND TYPE OF BIT		
3. DRILLING AGENCY		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)		
4. HOLE NO. (As shown on drawing title and file number)		12. MANUFACTURER'S DESIGNATION OF DRILL		
5. NAME OF DRILLER		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		14. TOTAL NUMBER CORE BOXES		
7. THICKNESS OF OVERBURDEN		15. ELEVATION GROUND WATER		
8. DEPTH DRILLED INTO ROCK		16. DATE HOLE		
9. TOTAL DEPTH OF HOLE		17. ELEVATION TOP OF HOLE <i>711.2</i>		
		18. TOTAL CORE RECOVERY FOR BORING		
		19. SIGNATURE OF INSPECTOR <i>K. H. ...</i>		

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
671.240			LT. BR		2025	2" x 2 1/2" DN. DR 40'-43'
	41	SP	ME & TO COARSE SAND	5# 14	48	
	42		DENCE WET	41/42	70	Sample 14 41'-42' JAR
	43		SOME GRAVEL		97	
			SA ME	D-3 R-3.3	STO 33	BOT 42 STD DRIVE 43'-45'
667.244			LT. BROWN		30	
	45	SP	SANDY GRAVEL		45	
	46		DENCE SATURATED		62	BOT 45
	47		55% GRAVEL	2025	105	2" x 2 1/4" DRIVE 45'-48'
	48		45% COARSE SAND	5# 15	110	Sample 15 46'-47' JAR
	49		1/2" SIZE & SMALLER	46/47	121	
			SA ME	D-3 R-2.8	STO 19	BOT 48 STD DRIVE 48'-50'
	50				26	
					31	(57)
661.250				D-2 R-1.1	59	BOT 50

DRILLING LOG		DIVISION		INSTALLATION		SHEET	
1. PROJECT <b>CHASKA DIKE</b>				<b>ST. PAUL DISTRICT</b>		<b>6</b> OF 6 SHEETS	
2. LOCATION (Coordinates or Station)				10. SIZE AND TYPE OF BIT		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY				12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number)		<b>26 79</b> <b>12m</b>		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED UNDISTURBED	
5. NAME OF DRILLER				14. TOTAL NUMBER CORE BOXES			
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.				15. ELEVATION GROUND WATER			
7. THICKNESS OF OVERBURDEN				16. DATE HOLE		STARTED COMPLETED	
8. DEPTH DRILLED INTO ROCK				17. ELEVATION TOP OF HOLE <b>711.2</b>			
9. TOTAL DEPTH OF HOLE				18. TOTAL CORE RECOVERY FOR BORING		%	
				19. SIGNATURE OF INSPECTOR <b>K. Harmon</b>			
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)	
661.2	50				2X3 1/2	2" x 2 1/2" DRIVE	
661.0	50.2				49	50'-53'	
	51	SP	LT. BROWN GRAVELLY SAND DENCE SATURATED		60		
	52		40% GRAVEL 60% COARSE SAND		83		
	53			D-3 R-1.9	STD 14	D.T. 53 STD. DRIVE 53'-55'	
	54			57.16 53/54	19	(53) sample #16 53'-54' JAN.	
	55		Bottom of Hole	D-2 R-1.4	21	Bot 55	
						Bot of hole 55'	

DRILLING LOG		DIVISION		INSTALLATION		SHEET	
1. PROJECT		NCD		St. Paul District		1 OF 7 SHEETS	
2. LOCATION (Coordinates or Station)		Chaska		10. SIZE AND TYPE OF BIT		3" Roller Bit	
3. DRILLING AGENCY		See sheet #7		11. DAYUM FOR ELEVATION SHOWN (TBM - MSL)		1929 NGVD	
4. HOLE NO. (As shown on drawing title and file number)		US-CE-C Ref #5 80-25M		12. MANUFACTURER'S DESIGNATION OF DRILL		CME-750	
5. NAME OF DRILLER		Ken Harmon		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED 17 Jars UNDISTURBED	
6. DIRECTION OF HOLE		<input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		14. TOTAL NUMBER CORE BOXES		701.6'	
7. THICKNESS OF OVERBURDEN				15. ELEVATION GROUND WATER		701.6'	
8. DEPTH DRILLED INTO ROCK				16. DATE HOLE		STARTED 8-6-80 COMPLETED 8-7-80	
9. TOTAL DEPTH OF HOLE		53.6'		17. ELEVATION TOP OF HOLE		726.6'	
				18. TOTAL CORE RECOVERY FOR BORING		5	
				19. SIGNATURE OF INSPECTOR		Eric Packer	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
726.6'	0.6'					
	1	SM	Silty Sand Fine Sand 55% Med Dense Silt 25% Dry Sub Ang-Sdbld Fm. Gravel 20% Lt. Brown	18	0' 5#1	Drove 2x3'
725.2'	1.4'	sharp			1.9'	Note 1) Performed Standard penetration tests unless otherwise noted 2) weight of hammer 140lb 3) length of drop 30"
	2	SC	Clayey Sand Med Dense Med Sand 30% Dry-Moist Coarse Sand 30% Ang. Fn Gravel 20% Greenish Brown Clay 10% Sil. Plastic Fn Sand 10%	30	1.5' 5#2	
	3			40	2.2'	
723.2'	3.4'	sharp		90	2.3'	Note 3' 3'
	4	SM	Silty Sand Fine Sand 50% Med Dense Silt 35% Dry-Moist Sub Ang-Fm Clay 15% Lt. Brown		3.5'	9
722.3'	4.3'	sharp			5#3	14
	5	SC	Clayey Sand Med Dense Med Sand 30% Dry-Moist Coarse Sand 30% Ang. Fn Gravel 20% Greenish Brown Clay 10% Sil. Plastic Fn Sand 10%	103' R116'	4.3'	14
721.0'	5.6'			29	5.6'	Note 5' 12 Set HSA to 5'
720.4'	6.2'	SM	Silty Sand Lt. Brown Med Dense Fm. Sand 50% Dry Moist Silt 35% Sub Ang Ang Clay 15%		5.6'	
	7	SC	Clayey Sand Loose Moist Sub Ang-Fm Brown Med Sand 30% Fn Gravel 20% Coarse Sand 30% Clay 10% Fn Sand 10%	51	6.2'	
	8			44	6.2'	
	9			102' R114	6.2'	Note 8' 8' 4 4 4 4



<b>DRILLING LOG</b>		<b>DIVISION</b> NCD	<b>INSTALLATION</b> St. Paul District	<b>SHEET</b> 2 OF 7 SHEETS
1. PROJECT Chaska			10. SIZE AND TYPE OF BIT	
2. LOCATION (Coordinates or Station)			11. DATUM FOR ELEVATION SHOWN (TBM or BSL)	
3. DRILLING AGENCY US-CE-C			12. MANUFACTURER'S DESIGNATION OF DRILL CME-750	
4. HOLE NO. (As shown on drawing title and file number) Ref #5 80-25M			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	
5. NAME OF DRILLER Ken Harman			14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN			16. DATE HOLE STARTED COMPLETED	
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE 726.6'	
9. TOTAL DEPTH OF HOLE			18. TOTAL CORE RECOVERY FOR BORING %	
			19. SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
716.6'	10.0	SC	Clayey Sand Loose Moist Subling. Ang. Discolor	2x2 1/2		Set HSA to 10'
716.2'	10.4	SP	Med Sand 30% Fr. Gravel 30% Clay 15% Clay 15%	7		Probe 2x3'
715.8'	10.8		Coarse Sand Coarse Sand 70% Med Sand 30% Ang			
	11		No Core	16		
	12			19		
713.6'	13	SP	Coarse Sand Wet Coarse Sand 65% Loose Brown Med Sand 35%	D3' 8.8'	5#6	Note 13' 13'
713.2'	13.4				5#7	1
	14	CL/SC	Sandy Clay Soft Sl. Plastic Wet Subling. Brown			2
	15		Clay 35% Med Sand 25% Fr. Gravel 25% Fr. Sand 15%	D2' 8.4'		2
	16					4
710.5'	16.1	SC	Clayey Sand Med Dense Sl. Plastic Moist-Wet Subling. - Ang Greenish Brown		5#8	Set HSA to 15'
	17					Pushed 2x3' with hydraulics
	18		Med Sand 40% Fr. Sand 30% Coarse Sand 20% Clay 10%	STD		Note 18' 18'
	19					3
707.2'	19.4		No Core	D2' 8.4'		5
						7
						13

DRILLING LOG		DIVISION		INSTALLATION		SHEET	
1. PROJECT		NCD		St. Paul District		3 OF 7 SHEETS	
2. LOCATION (Coordinates or Station)		Chaska		10. SIZE AND TYPE OF BIT			
3. DRILLING AGENCY		US-EE-C		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
4. HOLE NO. (As shown on drawing title and file number)		Ref #5 80-25M		12. MANUFACTURER'S DESIGNATION OF DRILL		CME-750	
5. NAME OF DRILLER		Ken Harman		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED UNDISTURBED	
6. DIRECTION OF HOLE		<input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		14. TOTAL NUMBER CORE BOXES			
7. THICKNESS OF OVERBURDEN				15. ELEVATION GROUND WATER			
8. DEPTH DRILLED INTO ROCK				16. DATE HOLE		STARTED COMPLETED	
9. TOTAL DEPTH OF HOLE				17. ELEVATION TOP OF HOLE		726.6'	
				18. TOTAL CORE RECOVERY FOR BORING		%	
				19. SIGNATURE OF INSPECTOR			

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
706.6'	20'		Fine Sand Loose - Med Dense Moist - Wet SubAng - SubRd Brown Fine Sand 70% Med Sand 15% Fine Gravel 15%		20	Set HSA to 20' Pushed 2x3' with hydraulic
704.5'	22'	SP			5#9	
	23'		Sandy Clay Stiff Sl. Plastic Moist - Wet Ang SubAng Brown Clay 35% Med Sand 25% Fine Sand 25% Fine Gravel 15%	D3' R2.4' STD	23'	Note 23'
	24'	CL			5#10	
	25'				24.2'	
	26'					
	27'					
698.6'	28'	SP		D3' R2.4' STD	28'	Note 28'
	29'	f	Coarse Sand Dense Wet - Sat. SubAng Black Med Sand 30% Fin. Gravel 30% Fin. Sand 10% Coarse Sand 10% Clay 5%	D3' R2.4' STD	29'	Set HSA to 29' Began using fine mud + 3" Miller Bit
	30'			D3' R2.4' STD	30'	Note 30'



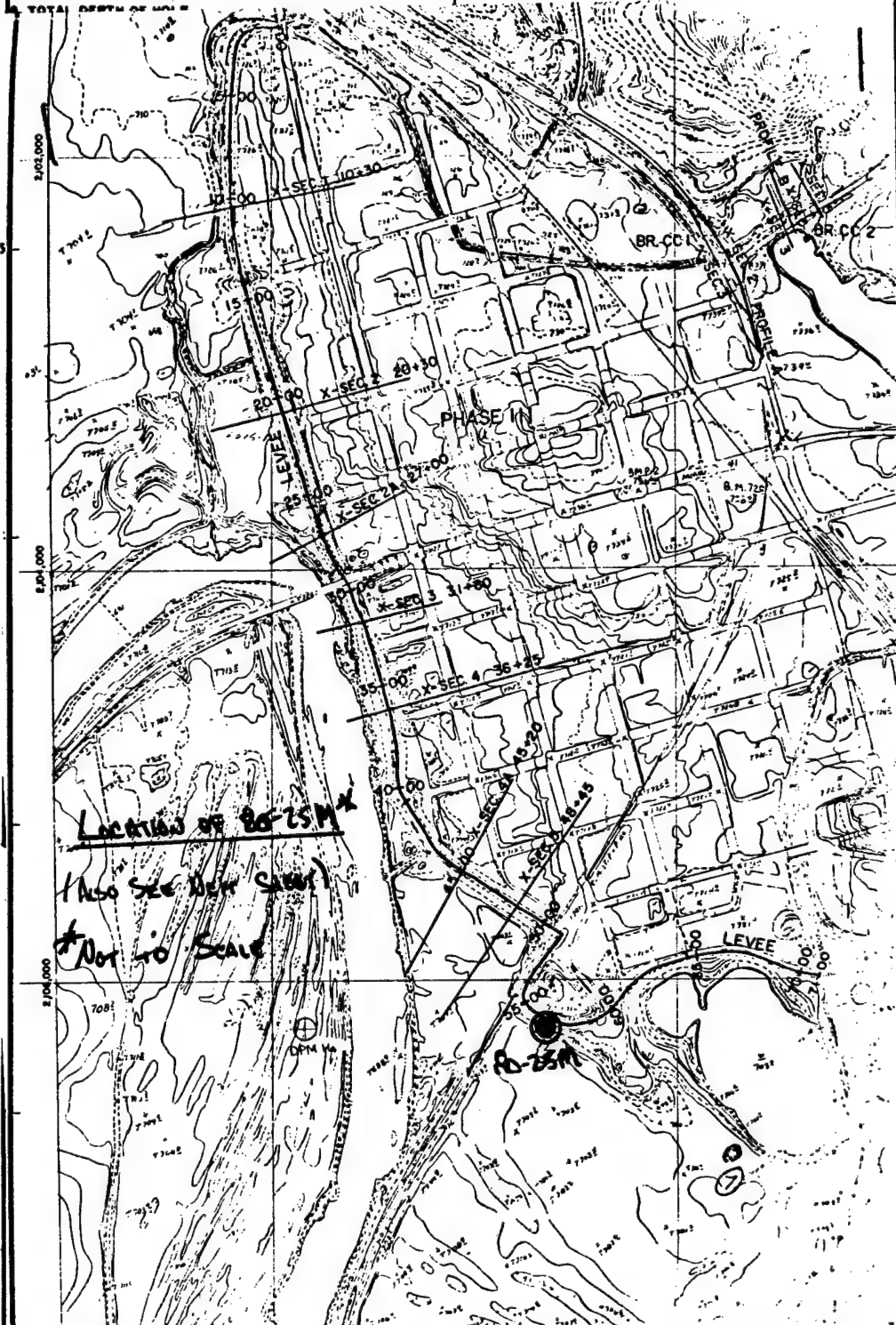
DRILLING LOG		DIVISION	INSTALLATION		SHEET 5 OF 7 SHEETS	
1. PROJECT		NCD	St. Paul District			
2. LOCATION (Coordinates or Station)						
3. DRILLING AGENCY			10. SIZE AND TYPE OF BIT			
4. HOLE NO. (As shown on drawing title and file number)			11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
5. NAME OF DRILLER			12. MANUFACTURER'S DESIGNATION OF DRILL			
6. DIRECTION OF HOLE			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN			
7. THICKNESS OF OVERBURDEN			14. TOTAL NUMBER CORE BOXES			
8. DEPTH DRILLED INTO ROCK			15. ELEVATION GROUND WATER			
9. TOTAL DEPTH OF HOLE			16. DATE HOLE			
			17. ELEVATION TOP OF HOLE			
			18. TOTAL CORE RECOVERY FOR BORING			
			19. SIGNATURE OF INSPECTOR			
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
686.6'	42.6'					
	41'	OH	Organic Clay Med stiff - stiff Plastic Sat. Dk. Gray	54.25		Drilled out hole to 46' Pushed in 3' with hydraulics
	42'		Clay 75% Silt 25%			
	43'			D3' R=0 STD		Note 43' 43'
	44'					
	45'			D2' R=0		Note 45' 45'
	46'					Dr. up to hole to 45' Pushed 2.5'
	47'	OH				
	48'			D3' R=0		Note 48' 48'
	49'					
	50'					
	51'					
	52'					
	53'					
	54'					
	55'					
	56'					
	57'					
	58'					
	59'					
	60'					

DRILLING LOG		DIVISION		INSTALLATION		SHEET	
1. PROJECT		NCD		St. Paul District		6 of 7 SHEETS	
2. LOCATION (Coordinates or Station)		Chaska		10. SIZE AND TYPE OF BIT			
3. DRILLING AGENCY		11. DATUM FOR ELEVATION SHOWN (TBM or BSS)		12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number)		Ref #5 80-25M		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED UNDISTURBED	
5. NAME OF DRILLER		Ken Harmon		14. TOTAL NUMBER CORE BOXES			
6. DIRECTION OF HOLE		<input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER			
7. THICKNESS OF OVERBURDEN				16. DATE HOLE		STARTED COMPLETED	
8. DEPTH DRILLED INTO ROCK				17. ELEVATION TOP OF HOLE		726.6'	
9. TOTAL DEPTH OF HOLE				18. TOTAL CORE RECOVERY FOR BORING		%	
19. SIGNATURE OF INSPECTOR				19. SIGNATURE OF INSPECTOR			

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
676.6'	50					
	51	CL	Silty Clay Med St.iff Plastic Sat. Greenish Gray Clay 70% S + 30%		50	Drilled out hole to 50' Pushed 2x2.5' with hydraulics Drove 2x2.5' at 5'
673.8'	52					
	53	ST	Med Sand Med. to Gr. S. S. V. to Gr. S. S. Gr. to Gr. S. S.	42 DR 3' 50	51	Note 53' 53'
673.0'	54		Bottom of rock			
	55					
	56					
	57					
	58					
	59					
	60					
	61					
	62					
	63					
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	95					
	96					
	97					
	98					
	99					
	100					

DRILLING LOG		DIVISION	INSTALLATION	Hole No. 80-25M	SHEET 7 OF 7 SHEETS
1. PROJECT		WCD	St. Paul District		
2. LOCATION (Coordinates or Station)		Chaska			
3. DRILLING AGENCY		US-CE-C			
4. HOLE NO. (As shown on opening title and file number)		Ref #5 80-25M			
5. NAME OF DRILLER		Ken Haimen			
6. DIRECTION OF HOLE		<input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			
7. THICKNESS OF OVERBURDEN		18. DATE HOLE			
8. DEPTH DRILLED INTO ROCK		19. SIGNATURE OF INSPECTOR			
9. TOTAL DEPTH OF HOLE		17. ELEVATION TOP OF HOLE 726.6'			
		18. TOTAL CORE RECOVERY FOR BORING			
		19. SIGNATURE OF INSPECTOR			



DRILLING LOG		DIVISION		INSTALLATION		SHEET	
1. PROJECT		2. LOCATION (Coordinates or Station)		3. DRILLING AGENCY		4. HOLE NO. (As shown on drawing title and file number)	
5. NAME OF DRILLER		6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		7. THICKNESS OF OVERBURDEN		8. DEPTH DRILLED INTO ROCK	
9. TOTAL DEPTH OF HOLE		10. SIZE AND TYPE OF BIT		11. DATUM FOR ELEVATION SHOWN (If other than bench mark)		12. MANUFACTURER'S DESIGNATION OF DRILL	
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		14. TOTAL NUMBER CORE BOXES		15. ELEVATION GROUND WATER		16. DATE HOLE STARTED _____ COMPLETED _____	
17. ELEVATION TOP OF HOLE		18. TOTAL CORE RECOVERY FOR BORING		19. SIGNATURE OF INSPECTOR		20. REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)	
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS	
718.25	0.0		dump Gravel 80% gravel (Gm)	25%	1	NOTES 1. weight of hammer is 140 lb. with 30" drop 2. Type of sampler indicated top of each drive	
	1.2		Silty Sandy Gravel (Gm)	4	2		
	1.0		Black 50 Gravel moist fine - coarse	5	3		
	2.0		med dense 25% Sand fine - coarse	10	4		
	3.0		fill Dump	20	5		
	4.0			30	6		
	5.0			40	7		
	6.0			50	8		
	7.0			60	9		
	8.0			70	10		
	9.0			80	11		
	10.0			90	12		
	11.0			100	13		
	12.0			110	14		
	13.0			120	15		
	14.0			130	16		
	15.0			140	17		
	16.0			150	18		
	17.0			160	19		
	18.0			170	20		
	19.0			180	21		
	20.0			190	22		
	21.0			200	23		
	22.0			210	24		
	23.0			220	25		
	24.0			230	26		
	25.0			240	27		
	26.0			250	28		
	27.0			260	29		
	28.0			270	30		
	29.0			280	31		
	30.0			290	32		
	31.0			300	33		
	32.0			310	34		
	33.0			320	35		
	34.0			330	36		
	35.0			340	37		
	36.0			350	38		
	37.0			360	39		
	38.0			370	40		
	39.0			380	41		
	40.0			390	42		
	41.0			400	43		
	42.0			410	44		
	43.0			420	45		
	44.0			430	46		
	45.0			440	47		
	46.0			450	48		
	47.0			460	49		
	48.0			470	50		
	49.0			480	51		
	50.0			490	52		
	51.0			500	53		
	52.0			510	54		
	53.0			520	55		
	54.0			530	56		
	55.0			540	57		
	56.0			550	58		
	57.0			560	59		
	58.0			570	60		



1 DRILLING LOG		DIVISION <i>NUCO</i>		INSTALLATION <i>ST Paul District</i>		Hole No. <i>82-51M</i>		SHEET <i>3</i> OF <i>6</i> SHEETS	
2. PROJECT <i>Chaska</i>				10. SIZE AND TYPE OF BIT					
3. LOCATION (Coordinates or Station)				11. DAYUM FOR ELEVATION SHOWN (FEM or MSL)					
5. DRILLING AGENCY				12. MANUFACTURER'S DESIGNATION OF DRILL					
4. HOLE NO. (As shown on drawing title and file number) <i>#14</i>				13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED		UNDISTURBED	
6. NAME OF DRILLER				14. TOTAL NUMBER CORE BOXES					
8. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.				15. ELEVATION GROUND WATER					
7. THICKNESS OF OVERBURDEN				16. DATE HOLE		STARTED		COMPLETED	
9. DEPTH DRILLED INTO ROCK				17. ELEVATION TOP OF HOLE <i>718.75</i>					
10. TOTAL DEPTH OF HOLE				18. TOTAL CORE RECOVERY FOR BORING					
				19. SIGNATURE OF INSPECTOR					
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)			
<i>708.75</i>	<i>10.0</i>		<i>Gravily Silty Sand (SM)</i>	<i>2x1/2</i>					
<i>708.15</i>	<i>10.6</i>		<i>Black moist med dense wood</i>	<i>4</i>					
<i>707.25</i>	<i>11.0</i>		<i>60% Sand 30% Silt 10% Gravel</i>	<i>9</i>	<i>5#3</i>				
	<i>11.5</i>		<i>Paper cloth pieces</i>		<i>11.0</i>				
	<i>12.0</i>			<i>7</i>	<i>11.5</i>				
<i>705.75</i>	<i>13.0</i>		<i>glass more paper wood</i>	<i>0-30</i>					
	<i>14.0</i>			<i>2-10</i>					
	<i>15.0</i>			<i>5#2</i>					
	<i>16.0</i>			<i>1</i>					
	<i>17.0</i>			<i>1</i>					
	<i>18.0</i>			<i>7</i>					
	<i>19.0</i>			<i>0-30</i>					
	<i>20.0</i>			<i>2-10</i>					
	<i>21.0</i>			<i>5#2</i>					
	<i>22.0</i>			<i>3</i>					
	<i>23.0</i>			<i>10</i>					
	<i>24.0</i>			<i>8</i>					
	<i>25.0</i>			<i>12</i>					
	<i>26.0</i>			<i>0-30</i>					
	<i>27.0</i>			<i>2-10</i>					
	<i>28.0</i>			<i>5#2</i>					
	<i>29.0</i>			<i>3</i>					
	<i>30.0</i>			<i>10</i>					
	<i>31.0</i>			<i>8</i>					
	<i>32.0</i>			<i>12</i>					
	<i>33.0</i>			<i>0-30</i>					
	<i>34.0</i>			<i>2-10</i>					
	<i>35.0</i>			<i>5#2</i>					
	<i>36.0</i>			<i>3</i>					
	<i>37.0</i>			<i>10</i>					
	<i>38.0</i>			<i>8</i>					
	<i>39.0</i>			<i>12</i>					
	<i>40.0</i>			<i>0-30</i>					
	<i>41.0</i>			<i>2-10</i>					
	<i>42.0</i>			<i>5#2</i>					
	<i>43.0</i>			<i>3</i>					
	<i>44.0</i>			<i>10</i>					
	<i>45.0</i>			<i>8</i>					
	<i>46.0</i>			<i>12</i>					
	<i>47.0</i>			<i>0-30</i>					
	<i>48.0</i>			<i>2-10</i>					
	<i>49.0</i>			<i>5#2</i>					
	<i>50.0</i>			<i>3</i>					
	<i>51.0</i>			<i>10</i>					
	<i>52.0</i>			<i>8</i>					
	<i>53.0</i>			<i>12</i>					
	<i>54.0</i>			<i>0-30</i>					
	<i>55.0</i>			<i>2-10</i>					
	<i>56.0</i>			<i>5#2</i>					
	<i>57.0</i>			<i>3</i>					
	<i>58.0</i>			<i>10</i>					
	<i>59.0</i>			<i>8</i>					
	<i>60.0</i>			<i>12</i>					
	<i>61.0</i>			<i>0-30</i>					
	<i>62.0</i>			<i>2-10</i>					
	<i>63.0</i>			<i>5#2</i>					
	<i>64.0</i>			<i>3</i>					
	<i>65.0</i>			<i>10</i>					
	<i>66.0</i>			<i>8</i>					
	<i>67.0</i>			<i>12</i>					
	<i>68.0</i>			<i>0-30</i>					
	<i>69.0</i>			<i>2-10</i>					
	<i>70.0</i>			<i>5#2</i>					
	<i>71.0</i>			<i>3</i>					
	<i>72.0</i>			<i>10</i>					
	<i>73.0</i>			<i>8</i>					
	<i>74.0</i>			<i>12</i>					
	<i>75.0</i>			<i>0-30</i>					
	<i>76.0</i>			<i>2-10</i>					
	<i>77.0</i>			<i>5#2</i>					
	<i>78.0</i>			<i>3</i>					
	<i>79.0</i>			<i>10</i>					
	<i>80.0</i>			<i>8</i>					
	<i>81.0</i>			<i>12</i>					
	<i>82.0</i>			<i>0-30</i>					
	<i>83.0</i>			<i>2-10</i>					
	<i>84.0</i>			<i>5#2</i>					
	<i>85.0</i>			<i>3</i>					
	<i>86.0</i>			<i>10</i>					
	<i>87.0</i>			<i>8</i>					
	<i>88.0</i>			<i>12</i>					
	<i>89.0</i>			<i>0-30</i>					
	<i>90.0</i>			<i>2-10</i>					
	<i>91.0</i>			<i>5#2</i>					
	<i>92.0</i>			<i>3</i>					
	<i>93.0</i>			<i>10</i>					
	<i>94.0</i>			<i>8</i>					
	<i>95.0</i>			<i>12</i>					
	<i>96.0</i>			<i>0-30</i>					
	<i>97.0</i>			<i>2-10</i>					
	<i>98.0</i>			<i>5#2</i>					
	<i>99.0</i>			<i>3</i>					
	<i>100.0</i>			<i>10</i>					

DRILLING LOG		DIVISION	INSTALLATION	SHEET 3 OF 6 SHEETS	
1. PROJECT		2. LOCATION (Coordinates or Station)		10. SIZE AND TYPE OF BIT	
3. DRILLING AGENCY		4. HOLE NO. (As shown on drawing title and file number)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
5. NAME OF DRILLER		6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		12. MANUFACTURER'S DESIGNATION OF DRILL	
7. THICKNESS OF OVERBURDEN		8. DEPTH DRILLED INTO ROCK		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	
9. TOTAL DEPTH OF HOLE		14. TOTAL NUMBER CORE BOXES		15. ELEVATION GROUND WATER	
		16. DATE HOLE		17. ELEVATION TOP OF HOLE	
		18. TOTAL CORE RECOVERY FOR BORING		19. SIGNATURE OF INSPECTOR	
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.
698.75	200		Organic oily glass gravelly silt Black Smelly - facili/smell Saturated loose	2x2 1/2 P 4 5 H E D	5#5 21.0 21.5
	210				
	220				
	230			0-30 R-1.7 5#1 2	
	240			2	
694.25	275		Organic Sandy Silty Clay Dark gray Wet Silt Plastic Plant material / Shell fragments Swamp deposit	3 0-30 R-2.0 2x2 1/2 P 4 5 H E D	5#6 26.0 26.5
	250				
	260				
	270			0-30 R-2.1 5#2 2	
	280			2	
	290			2	
688.25	300			0-30 R-3.0 5#3 2	

DRILLING LOG		DIVISION		INSTALLATION		Hole No. 82-51/M	
1. PROJECT		2. LOCATION (Coordinates or Station)		3. DRILLING AGENCY		4. HOLE NO. (As shown on drawing title and file number)	
5. NAME OF DRILLER		6. DIRECTION OF HOLE		7. THICKNESS OF OVERBURDEN		8. DEPTH DRILLED INTO ROCK	
9. TOTAL DEPTH OF HOLE		10. SIZE AND TYPE OF BIT		11. DAYUM FOR ELEVATION SHOWN (TBM or BBL)		12. MANUFACTURER'S DESIGNATION OF DRILL	
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		14. TOTAL NUMBER CORE BOXES		15. ELEVATION GROUND WATER		16. DATE HOLE	
17. ELEVATION TOP OF HOLE		18. TOTAL CORE RECOVERY FOR BORING		19. SIGNATURE OF INSPECTOR		20. SHEET OF 6 SHEETS	
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)	
687.5	28.0	c	Organic sandy silty clay (OL-CL)	2x2 1/2			
			Dark gray wet plastic med stiff shell fragments plant material Organic	P			
				4			
				5			
				H	#7		
				E	31.0	687.75	
				D	31.5		
				0-30			
				R			
				2			
				3			
				4		687.75	
				3			
				0-20			
				R			
				2x2 1/2			
				P			
				4			
				5			
				H	#8		
				E	36.0	682.75	
				D	36.5		
				0-30			
				R-30			
				3-4			
				6			
				6			
				7		679.75	
				7			
				0-20			
				R-20			
679.75	40.0						

NOTE: Set. Hollow stem to 380

MRD # 83/67

LL = 89 PL = 35

PI = 59

SN# 3-A-92

NOTE: Set. Hollow stem to 400

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT Chaska

HOLE NO. 82-51/M

8-23

Hole No. 82-51M

DIVISION <b>NCO</b>		INSTALLATION <b>St Paul District</b>	
PROJECT <b>Chaska</b>		SHEET <b>5</b> OF <b>6</b> SHEETS	
1. PROJECT		10. SIZE AND TYPE OF BIT	
2. LOCATION (Coordinate or Station)		11. DATUM FOR ELEVATION SHOWN (BM or MSL)	
3. DRILLING AGENCY		12. MANUFACTURER'S DESIGNATION OF DRILL	
4. HOLE NO. (As shown on drawing title and file number) <b>#14</b>		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE <b>STARTED</b> <b>COMPLETED</b>	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE <b>718.25</b>	
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING <b>5</b>	
		19. SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVER- ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
678.75	40.0		Organic silty clay (CL <sub>OG</sub> ) Dark gray Plastic Organic Shell & wet med stiff Plants	2x1 1/2 P 4 5		
677.75	41.0		Sandy silty clay (CL) greenish gray stiff to very stiff Plastic 60% clay 30% silt 10% sand fine	H E D 0-3.0 R-3.0	5#9 41.0 41.5	677.75
675.25	43.5		Silt sandy broken gravel (GW) Very hard Saturated Broken pieces of gravel	56 43	5#10 44.0 44.5	NOTE 1. All tools removed 2. Hole cemented
673.75	45.0		End Boring	38 0-2.0 R-1.5		
	46.0					
	47.2					
	48.0					
	49.2					
668.75	50.0					

DRILLING LOG		DIVISION <u>NCD</u>		INSTALLATION <u>ST Paul District</u>		Hole No. <u>K2-51M</u>	
1. PROJECT <u>CHASKA</u>		10. SIZE AND TYPE OF BIT		11. DATUM FOR ELEVATION SHOWN (TBM or BM)		SHEET <u>6</u> OF <u>6</u> SHEETS	
2. LOCATION (Coordinates or Station)		12. MANUFACTURER'S DESIGNATION OF DRILL		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED <input type="checkbox"/> UNDISTURBED <input type="checkbox"/>	
3. DRILLING AGENCY		14. TOTAL NUMBER CORE BOXES		15. ELEVATION GROUND WATER		16. DATE HOLE <input type="checkbox"/> STARTED <input type="checkbox"/> COMPLETED	
4. HOLE NO. (As shown on drawing title and file number) <u>#14</u>		17. ELEVATION TOP OF HOLE <u>718.75</u>		18. TOTAL CORE RECOVERY FOR BORING <u>1</u>		19. SIGNATURE OF INSPECTOR	
5. NAME OF DRILLER		6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		7. THICKNESS OF OVERBURDEN		8. DEPTH DRILLED INTO ROCK	
9. TOTAL DEPTH OF HOLE		ELEVATION		DEPTH		LEGEND	
		CLASSIFICATION OF MATERIALS (Description)		% CORE RECOVERY		BOX OR SAMPLE NO.	
		REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)					
		Location diagram not to scale					

DRILLING LOG		DIVISION		INSTALLATION		SHEET	
1. PROJECT <b>Chaska Stage 4</b>		NCO		6. P. and District		SHEET 1 OF 1	
2. LOCATION (Coordinates or Station) <b>See drawing, page 11</b>				10. SIZE AND TYPE OF BIT <b>8" HSA 2 1/2" B.S.</b>			
3. DRILLING AGENCY <b>US-CE-C</b>				11. DAY FOR ELEVATION KNOWN (Year or Date) <b>NGVD 1989 ADJ</b>			
4. HOLE NO. (As shown on drawing title and file number) <b># 8</b>				12. MANUFACTURER'S DESIGNATION OF DRILL <b>CME-750</b>			
5. NAME OF DRILLER <b>Ken Harmon</b>				13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN <b>21 Jar</b>		DISTURBED <b>21 Jar</b>	
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.				14. TOTAL NUMBER CORE BOXES			
7. THICKNESS OF OVERBURDEN <b>100.0</b>				15. ELEVATION GROUND WATER <b>698.6</b>			
8. DEPTH DRILLED INTO ROCK <b>0.0</b>				16. DATE HOLE <b>5/26/89</b>		STARTED <b>5/27/89</b>	
9. TOTAL DEPTH OF HOLE <b>100.0</b>				17. ELEVATION TOP OF HOLE <b>725.53</b>			
				18. TOTAL CORE RECOVERY FOR BORING <b>1</b>			
				19. SIGNATURE OF INSPECTOR <b>Tom Hingelgren</b>			
ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)	
725.5	0.0		Fill	2x2 1/2			
	1.0	SM	Rubblly, (SM) Gravelly, silty Sand	P		① SPT = 140 lb @ 30" drop	
	2.0		- loose	U			
	3.0		- Dry	S			
	4.0		- Brown	H			
	5.0		50% Fine Sand	E			
	6.0		30% Silt	D			
	7.0		15% Fine gravel				
	8.0		<del>Concrete bunks</del>				
	9.0		<del>Concrete bunks</del>				
	10.0		Fill (SP)	2x2 1/2			
	11.0	SM	Gravelly Sand	P			
	12.0		- loose	U			
	13.0		- Dry to moist	S			
	14.0		- Brown	H			
	15.0		85% Very Fine Sand	E			
	16.0		15% Fine, rounded gravel	D			
	17.0						
	18.0						
	19.0						
	20.0						
	21.0						
	22.0						
	23.0						
	24.0						
	25.0						
	26.0						
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	92.0						
	93.0						
	94.0						
	95.0						
	96.0						
	97.0						
	98.0						
	99.0						
	100.0						

File No. 89-12/4M

<b>DRILLING LOG</b>		DIVISION <b>NCD</b>		INSTALLATION <b>St. Paul District</b>		SHEET <b>1</b> OF <b>1</b> SHEETS	
1. PROJECT <b>Chaska</b>				10. SIZE AND TYPE OF BIT			
2. LOCATION (Coordinate or Station)				11. DATUM FOR ELEVATION SHOWN (TBM or BM)			
3. DRILLING AGENCY				12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number)				13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED	
5. NAME OF DRILLER				14. TOTAL NUMBER CORE BOXES		UNDISTURBED	
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.				15. ELEVATION GROUND WATER			
7. THICKNESS OF OVERBURDEN				16. DATE HOLE		STARTED	
8. DEPTH DRILLED INTO ROCK				17. ELEVATION TOP OF HOLE		COMPLETED	
9. TOTAL DEPTH OF HOLE				18. TOTAL CORE RECOVERY FOR BORING		3	
				19. SIGNATURE OF INSPECTOR <i>Tom Hingorner</i>			

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
715.5	10.0	SP SM	(SP) <u>Gravelly Sand</u> cont.	2x2x	5	
	11.0		- loose - Dry to moist - Brown	20	SM3	④ Clean hole to 15.0' with 3" HSA
	12.0		85% Very Fine Sand 15% Fine gravel	24	13.5 14.5	
	13.0			D 30 R 2.7 T 180 SPT	8	
712.2	13.3		Fill (SP)	11	6	
	14.0		<u>Rubblly, Gravelly Sand</u>	5	18.0 18.0 2x2x	
	15.0	SM	- loose - Dry to moist - Brown to Black	P U S H E D	SM4 18.0 19.0	⑤ Clean hole to 20.0' with 3" HSA
	16.0		70% Very Fine Sand 30% Rounded gravel, Fine and Coarse			
	17.0		<del>Concrete</del> <del>Gravel</del> <del>Spent Bank</del>	D 30 R 30 T 180 SPT	3	
	18.0			2		
	19.0	SM		3		
705.4	20.0			D 30 R 30 T 180 SPT	3	

DRILLING LOG		DIVISION		INSTALLATION		SHEET	
1. PROJECT		NCD		St. Paul Dist		89-106M	
2. LOCATION (Coordinates or Station)		Chaska		10. SIZE AND TYPE OF BIT		11. DAYUM FOR ELEVATION SHOWN (FEET - INCHES)	
3. DRILLING AGENCY				12. MANUFACTURER'S DESIGNATION OF DRILL		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	
4. HOLE NO. (As shown on drawing title and file number)				14. TOTAL NUMBER CORE BOXES		15. ELEVATION GROUND WATER	
5. NAME OF DRILLER				16. DATE HOLE		17. ELEVATION TOP OF HOLE	
6. DIRECTION OF HOLE		<input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		18. DATE HOLE		19. SIGNATURE OF INSPECTOR	
7. THICKNESS OF OVERBURDEN				18. DATE HOLE		19. SIGNATURE OF INSPECTOR	
8. DEPTH DRILLED INTO ROCK				18. DATE HOLE		19. SIGNATURE OF INSPECTOR	
9. TOTAL DEPTH OF HOLE				18. DATE HOLE		19. SIGNATURE OF INSPECTOR	
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SCORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)	
705.5	20.0	SP-5M	Rubbly, Gravelly Sand (SP)	2x2x2			
704.5	21.0		Cont. See previous page.	PUSHED			
	22.0	SP-5M	Sand (SP)				
	23.0		- loose	3			
	24.0		- moist; wet below 23.0'	2			
	25.0		- Brown	2			
	26.0		90% Fine, granular Sand	3			
	27.0		10% Fine, round and angular gravel	2x2x2			
	28.0	SP-5M		PUSHED			
698.6	28.9			2		⑥ Tried to obtain water level with 3" HSA at 25.0' - unsuccessful.	
	29.0			2			
	30.0			2			
697.0	30.5		Color change from brown to gray.	2			
696.5	31.0		fluvial Clayey Silt (mc)	2			
	32.0		(over)	2			
695.0	32.0			2			



DRILLING LOG		DIVISION	INSTALLATION	SHEET NO. 89-10611	
1. PROJECT		NCD	St. Paul District	OF 11 SHEETS	
2. LOCATION (Coordinate or Station)		3. DRILLING AGENCY			
4. HOLE NO. (As shown on drawing title and file number)		5. NAME OF DRILLER			
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		7. THICKNESS OF OVERBURDEN			
8. DEPTH DRILLED INTO ROCK		9. TOTAL DEPTH OF HOLE			
10. SIZE AND TYPE OF BIT		11. DAYUM FOR ELEVATION SHOWN (TBM or BLS)			
12. MANUFACTURER'S DESIGNATION OF DRILL		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN			
14. TOTAL NUMBER CORE BOXES		15. ELEVATION GROUND WATER			
16. DATE HOLE		17. ELEVATION TOP OF HOLE			
18. TOTAL CORE RECOVERY FOR BORING		19. SIGNATURE OF INSPECTOR			
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.
695.5	20.0	ML	Clayey Silt (ML) - Soft - Nonplastic - wet - Black	2x24	P U S H E D
693.8	31.7		70% Silt 25% Clay 5% Organics (Twigs, roots)	0 2.0 R 2.0 T 2.0 SPT	4
	34.0	Ch OC	Silty Clay (OL) - Soft to med stiff - low plasticity - moist - Black	3	4
	37.0		70% Clay 15% Silt	4	4
	40.0		15% Undecomposed weeds and grasses, twigs, roots.	0 2.0 R 2.2 T 2.2 SPT	6
	43.0	Ch OC		6	6
	46.0			6	6
	49.0			6	6
	52.0			6	6
	55.0			6	6
	58.0			6	6
	61.0			6	6
	64.0			6	6
	67.0			6	6
	70.0			6	6
	73.0			6	6
	76.0			6	6
	79.0			6	6
	82.0			6	6
	85.0			6	6
	88.0			6	6
	91.0			6	6
	94.0			6	6
	97.0			6	6
	100.0			6	6
	103.0			6	6
	106.0			6	6
	109.0			6	6
	112.0			6	6
	115.0			6	6
	118.0			6	6
	121.0			6	6
	124.0			6	6
	127.0			6	6
	130.0			6	6
	133.0			6	6
	136.0			6	6
	139.0			6	6
	142.0			6	6
	145.0			6	6
	148.0			6	6
	151.0			6	6
	154.0			6	6
	157.0			6	6
	160.0			6	6
	163.0			6	6
	166.0			6	6
	169.0			6	6
	172.0			6	6
	175.0			6	6
	178.0			6	6
	181.0			6	6
	184.0			6	6
	187.0			6	6
	190.0			6	6
	193.0			6	6
	196.0			6	6
	199.0			6	6
	202.0			6	6
	205.0			6	6
	208.0			6	6
	211.0			6	6
	214.0			6	6
	217.0			6	6
	220.0			6	6
	223.0			6	6
	226.0			6	6
	229.0			6	6
	232.0			6	6
	235.0			6	6
	238.0			6	6
	241.0			6	6
	244.0			6	6
	247.0			6	6
	250.0			6	6
	253.0			6	6
	256.0			6	6
	259.0			6	6
	262.0			6	6
	265.0			6	6
	268.0			6	6
	271.0			6	6
	274.0			6	6
	277.0			6	6
	280.0			6	6
	283.0			6	6
	286.0			6	6
	289.0			6	6
	292.0			6	6
	295.0			6	6
	298.0			6	6
	301.0			6	6
	304.0			6	6
	307.0			6	6
	310.0			6	6
	313.0			6	6
	316.0			6	6
	319.0			6	6
	322.0			6	6
	325.0			6	6
	328.0			6	6
	331.0			6	6
	334.0			6	6
	337.0			6	6
	340.0			6	6
	343.0			6	6
	346.0			6	6
	349.0			6	6
	352.0			6	6
	355.0			6	6
	358.0			6	6
	361.0			6	6
	364.0			6	6
	367.0			6	6
	370.0			6	6
	373.0			6	6
	376.0			6	6
	379.0			6	6
	382.0			6	6
	385.0			6	6
	388.0			6	6
	391.0			6	6
	394.0			6	6
	397.0			6	6
	400.0			6	6
	403.0			6	6
	406.0			6	6
	409.0			6	6
	412.0			6	6
	415.0			6	6
	418.0			6	6
	421.0			6	6
	424.0			6	6
	427.0			6	6
	430.0			6	6
	433.0			6	6
	436.0			6	6
	439.0			6	6
	442.0			6	6
	445.0			6	6
	448.0			6	6
	451.0			6	6
	454.0			6	6
	457.0			6	6
	460.0			6	6
	463.0			6	6
	466.0			6	6
	469.0			6	6
	472.0			6	6
	475.0			6	6
	478.0			6	6
	481.0			6	6
	484.0			6	6
	487.0			6	6
	490.0			6	6
	493.0			6	6
	496.0			6	6
	499.0			6	6
	502.0			6	6
	505.0			6	6
	508.0			6	6
	511.0			6	6
	514.0			6	6
	517.0			6	6
	520.0			6	6
	523.0			6	6
	526.0			6	6
	529.0			6	6
	532.0			6	6
	535.0			6	6
	538.0			6	6
	541.0			6	6
	544.0			6	6
	547.0			6	6
	550.0			6	6
	553.0			6	6
	556.0			6	6
	559.0			6	6
	562.0			6	6
	565.0			6	6
	568.0			6	6
	571.0			6	6
	574.0			6	6
	577.0			6	6
	580.0			6	6
	583.0			6	6
	586.0			6	6
	589.0			6	6
	592.0			6	6
	595.0			6	6
	598.0			6	6
	601.0			6	6
	604.0			6	6
	607.0			6	6
	610.0			6	6
	613.0			6	6
	616.0			6	6
	619.0			6	6
	622.0			6	6
	625.0			6	6
	628.0			6	6
	631.0			6	6
	634.0			6	6
	637.0			6	6
	640.0			6	6
	643.0			6	6
	646.0			6	6
	649.0			6	6
	652.0			6	6
	655.0			6	6
	658.0			6	6
	661.0			6	6
	664.0			6	6
	667.0			6	6
	670.0			6	6
	673.0			6	6
	676.0			6	6
	679.0			6	6
	682.0			6	6
	685.0			6	6
	688.0			6	6
	691.0			6	6
	694.0			6	6
	697.0			6	6
	700.0			6	6
	703.0			6	6
	706.0			6	6
	709.0			6	6
	712.0			6	6
	715.0			6	6
	718.0			6	6
	721.0			6	6
	724.0			6	6
	727.0			6	6
	730.0			6	6
	733.0			6	6
	736.0			6	6
	739.0			6	6
	742.0			6	6
	745.0			6	6
	748.0			6	6
	751.0			6	6
	754.0			6	6
	757.0			6	6
	760.0			6	6
	763.0			6	6
	766.0				

File No. 89-106M

<b>DRILLING LOG</b>		DIVISION <b>NCD</b>	INSTALLATION <b>St. Paul District</b>	SHEET <b>OF 21 SHEETS</b>
1. PROJECT <b>Chaska</b>		10. SIZE AND TYPE OF BIT		
2. LOCATION (Coordinate or Station)		11. DAYUM FOR ELEVATION SHOWN (FWS or MSL)		
3. DRILLING AGENCY		12. MANUFACTURER'S DESIGNATION OF DRILL		
4. HOLE NO. (As shown on drawing title and file number)		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED	UNDISTURBED
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES		
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER		
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED _____ COMPLETED _____		
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE		
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING		
		19. SIGNATURE OF INSPECTOR		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
685.5	40.0	Ch SC	<u>Silty Clay</u> (CL) cont.  - Soft - low plasticity - moist - Black  70% Clay 15% Silt 15% Organic material	2424 P U S H E D	5410 430 43.6	(14) Clean hole to 45.0' with 2 3/8" Roller Bit  - low water loss: - 1 gal/min
682.8	42.7	CL	<u>Sandy, Silty Clay</u> (CL)  - Medium soft to stiff	230 R 30 T 43.0 SPT 8		
681.5	44.0		- slightly plastic - wet - Black  65% Clay 25% Silt 10% Fine Sand	8 8 8 R 2.8 T 46.0 2424 13		
	47.0	SP	<u>Sand</u>  - loose - wet - grey to brown  90% Fine Sand 10% Fine, rounded gravel	26 31 D 3.0 R 1.0 T 48.0 SPT 5 8 9	3411 480 44.0	(15) Clean hole to 50.0' with 2 3/8" Roller Bit.  - Water loss = - 20 gal/min
675.5	50.0			15 R 2.0 T 50.0		

DRILLING LOG			DIVISION		INSTALLATION		SHEET	
1. PROJECT			2. LOCATION (Coordinate or Station)		3. DRILLING AGENCY		4. HOLE NO. (As shown on drawing title and file number)	
5. NAME OF DRILLER			6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		7. THICKNESS OF OVERBURDEN		8. DEPTH DRILLED INTO ROCK	
9. TOTAL DEPTH OF HOLE			10. DATE HOLE		11. ELEVATION GROUND WATER		12. SIGNATURE OF INSPECTOR	
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN			14. TOTAL NUMBER CORE BOXES		15. ELEVATION TOP OF HOLE		16. TOTAL CORE RECOVERY FOR BORING	
17. ELEVATION TOP OF HOLE			18. DATE HOLE		19. SIGNATURE OF INSPECTOR		20. SIGNATURE OF INSPECTOR	
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	1. CORE RECOVERY	2. BOX OR SAMPLE NO.	3. REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)		
675.5	50.0	SP	Sand (SP) cont. - loose to medium dense - wet - Brown - slightly Calcareous	2x24		① Clean hole to 55.0' with 2 3/4" water loss approx. 20 gal/min		
	50.0			0 2.0 R 1.5 T 2.0	54.0			
	50.0			SPT	12			
	50.0		90% Fine Sand 10% Fine, round Gravel		14			
	50.0				14			
	50.0				20			
	50.0		Gravelly Sand (SW) - medium dense - wet - grey to Brown - Calcareous	2x24	40	② Thicken drilling mud with Liquid bentonite - (T-100), approx. 12 oz. added to previous Bent/H <sub>2</sub> O ratio.		
	50.0	SP			45			
	50.0				47			
	50.0	SW	80% Fine and Medium Sand 20% Fine, round Gravel	0 2.0 R 2.0 T 2.0	54.0	③ Clean hole to 60.0' with 2 3/4" Roller Bit Water loss: - 10 gal/min		
	50.0			SPT	13			
	50.0				18			
	50.0				20			
	50.0				24			
	50.0				24			

DRILLING LOG		DIVISION		INSTALLATION		SHEET	
PROJECT		NCD		St. Paul District		89-106m	
LOCATION (Coordinates or Station)		Chaska		10. SIZE AND TYPE OF BIT		11. DAY FOR ELEVATION SHOWN (TODAY or DATE)	
3. DRILLING AGENCY				12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number)				13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED UNDISTURBED	
5. NAME OF DRILLER				14. TOTAL NUMBER CORE BOXES			
6. DIRECTION OF HOLE				15. ELEVATION GROUND WATER			
<input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.				16. DATE HOLE		STARTED COMPLETED	
7. THICKNESS OF OVERBURDEN				17. ELEVATION TOP OF HOLE			
8. DEPTH DRILLED INTO ROCK				18. TOTAL CORE RECOVERY FOR BORING		%	
9. TOTAL DEPTH OF HOLE				19. SIGNATURE OF INSPECTOR			
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)	
665.5	60.0	SW	Gravelly Sand (sw) cont.	25%		① Clean hole to 65.0' with 3" HSA  - Water loss = 10 gal/min	
			- Medium dense	33			
			- wet	50			
			- Brown	56			
			- Slightly Calcareous	56			
	61.0						
			80% Fine through Medium Sand	12			
		SW	20% Fine, rounded Gravel	18			
				22			
				25			
				35			
				40			
				46			
				12			
				13			
				18			
				18			
655.8	100.0	SW				② Clean hole to 70.0' with 3" HSA.  - Water loss = 10 gal/min	

**DRILLING LOG**

1. PROJECT: Chaska

2. LOCATION (Coordinate or Station):

3. DRILLING AGENCY:

4. HOLE NO. (As shown on drawing title and file number):

5. NAME OF DRILLER:

6. DIRECTION OF HOLE:  
☐ VERTICAL ☐ INCLINED \_\_\_\_\_ DEG. FROM VERT.

7. THICKNESS OF OVERBURDEN:

8. DEPTH DRILLED INTO ROCK:

9. TOTAL DEPTH OF HOLE:

DIVISION: NCD

INSTALLATION: St. Paul District

10. SIZE AND TYPE OF BIT:

11. DATUM FOR ELEVATION SHOWN (TBM or BMS):

12. MANUFACTURER'S DESIGNATION OF DRILL:

13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED UNDISTURBED

14. TOTAL NUMBER CORE BOXES:

15. ELEVATION GROUND WATER:

16. DATE HOLE: STARTED COMPLETED

17. ELEVATION TOP OF HOLE:

18. TOTAL CORE RECOVERY FOR BORING: 5

19. SIGNATURE OF INSPECTOR: Higley

Hole No. 89-106m

SHEET 2 OF 11 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
655.5	70.0	SW	(SW) <u>Gravelly Sand</u> - medium dense	27		
	71.0		- wet			
654.2	71.3		- Brown	39		② Clean hole to 75.0' with 2 3/8" Roller Bit
	72.0		- Slightly Calcareous			
	73.0	SP	80% Fine and Medium Sand 20% Fine, round Gravel	35		- water loss = 10 gal/min
	74.0		(SP) <u>Gravelly Sand</u>	10		
	75.0		- loose to medium dense	11		
	76.0		- wet	14		
	77.0		- Brown	36		
	78.0		- Slightly Calcareous	63		② Clean hole to 80.0' with 2 3/8" Roller Bit
	79.0	SP	80% Fine to med. Sand 20% Fine, round and angular Gravel	75		- water loss: 10 gal/min
	80.0			15		
	81.0			20		
	82.0			20		
	83.0			21		

B-33

Hole No. 89-106m

<b>DRILLING LOG</b>		DIVISION <b>NCD</b>	INSTALLATION <b>St. Paul District</b>		SHEET <b>9</b> OF 11 SHEETS
1. PROJECT <b>Chaska</b>			10. SIZE AND TYPE OF BIT		
2. LOCATION (Coordinate or Station)			11. DATUM FOR ELEVATION SHOWN (TBM or BM)		
3. DRILLING AGENCY			12. MANUFACTURER'S DESIGNATION OF DRILL		
4. HOLE NO. (As shown on drawing title and file number)			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		13. DISTURBED <input type="checkbox"/> UNDISTURBED <input type="checkbox"/>
5. NAME OF DRILLER			14. TOTAL NUMBER CORE BOXES		
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER		
7. THICKNESS OF OVERBURDEN			16. DATE HOLE		16. STARTED <input type="checkbox"/> COMPLETED <input type="checkbox"/>
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE		
9. TOTAL DEPTH OF HOLE			18. TOTAL CORE RECOVERY FOR BORING		
			19. SIGNATURE OF INSPECTOR <i>[Signature]</i>		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	SCORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
645.5	80.0	SP	Gravelly Sand (SP)	2x24		
			cont.	42		
644.2	81.0		Medium dense			② Clean hole to 85.0' with 2 3/8" Roller Bit
	81.3	SP	- wet	53	SM18 830 84.0	
	82.0		- Brown	58		
	83.0		- Slightly Calcareous	D 3.0 R 2.5 T 88.0 SPT 10		
	84.0		80% Fine to Med. Sand	11		
	85.0		80% Fine, round and angular Gravel	14		
	86.0	SP	Sand (SP)	20		③ Clean hole to 90.0' with 2 3/8" Roller Bit
	87.0		- medium dense to dense	39		
	88.0		- wet	69	SM19 880 89.0	
	89.0		- Brown	83		
	90.0		- Slightly Calcareous	D 3.0 R 2.1 T 88.0 SPT 19		
	91.0		- 90% Fine Sand	25		
	92.0		5% Coarse sand	33		
	93.0		5% silt	33		
635.6	90.0	SP	trace Fine gravel	33		

File No. 89-106m

DIVISION		INSTALLATION		SHEET	
DRILLING LOG		NCD		St. Paul District	
1. PROJECT		10. SIZE AND TYPE OF BIT		11. DATUM FOR ELEVATION SHOWN (TBM or BML)	
2. LOCATION (Coordinate or Station)		3. DRILLING AGENCY		12. MANUFACTURER'S DESIGNATION OF DRILL	
3. HOLE NO. (As shown on drawing title and file number)		4. HOLE NO. (As shown on drawing title and file number)		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	
5. NAME OF DRILLER		6. DIRECTION OF HOLE		14. TOTAL NUMBER CORE BOXES	
7. THICKNESS OF OVERBURDEN		8. DEPTH DRILLED INTO ROCK		15. ELEVATION GROUND WATER	
9. TOTAL DEPTH OF HOLE		16. DATE HOLE		17. ELEVATION TOP OF HOLE	
		18. TOTAL CORE RECOVERY FOR BORING		19. SIGNATURE OF INSPECTOR	
				20. SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
a	b	c	d	e	f	g
685.5	90.0		Sand (SP)	22 1/2		
		SP	cont. see previous page.	28		
	91.0		Gradational Contact (SP)			
			Gravelly Sand	86		
	92.0		- Medium dense	80		
			- wet			
	93.0		- Brown			
		SP	- Slightly Calcareous	23		
	94.0			36		
			80% Medium Sand	52		
680.7	94.8	SP				
680.5	95.0		20% Fine, sand gravel	59		
		SW	Sand (SP)			
	96.0		- dense	106		
			- wet			
	97.0		- Brown			
			- Slight Fe stain	84		
			- Slightly Calcareous			
	98.0		45% Fine Sand			
			5% Fine, rounded Gravel	17		
	99.0	SW	Gravelly Sand (SW)	20		
			- medium dense			
			- wet - Brown	21		
			70% Fine and med. sized			
			80% Fine, rounded Gravel			
625.6	100.0		End of Boring			

DRILLING LOG			DIVISION		INSTALLATION		Hole No. <b>89-106m</b>	
1. PROJECT <b>Chaska</b>			<b>NKD</b>		<b>St. Paul District</b>		SHEET <b>11</b> OF <b>11</b> SHEETS	
2. LOCATION (Coordinate or Station)			3. DRILLING AGENCY		10. SIZE AND TYPE OF BIT			
4. HOLE NO. (As shown on drawing title and file number)			5. NAME OF DRILLER		11. DATUM FOR ELEVATION SHOWN (FEM or MSL)			
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			7. THICKNESS OF OVERBURDEN		12. MANUFACTURER'S DESIGNATION OF DRILL			
8. DEPTH DRILLED INTO ROCK			9. TOTAL DEPTH OF HOLE		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED    UNDISTURBED	
14. DATE HOLE			15. ELEVATION GROUND WATER		16. TOTAL NUMBER CORE BOXES		17. ELEVATION TOP OF HOLE	
18. TOTAL CORE RECOVERY FOR BORING			19. SIGNATURE OF INSPECTOR		20. DATE HOLE		STARTED    COMPLETED	
21. SIGNATURE OF INSPECTOR			22. SIGNATURE OF INSPECTOR		23. SIGNATURE OF INSPECTOR		24. SIGNATURE OF INSPECTOR	
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)		
625.5	100.0		End of Boring					
						<p style="text-align: right;">Courthouse Lake</p> <p style="text-align: center;">N</p>		



No. 89-110 M

<b>DRILLING LOG</b>		<b>DIVISION</b> NCD		<b>INSTALLATION</b> St. Paul District	
<b>1. PROJECT</b> Chaska Stage 4		<b>10. SIZE AND TYPE OF BIT</b> 3" HSA 2 1/2" RB, 1 1/2" RB		<b>11. DATUM FOR ELEVATION</b> NGVD 1929 ADT	
<b>2. LOCATION</b> (Coordinates or Station) See drawing, page 7		<b>12. MANUFACTURER'S DESIGNATION OF DRILL</b> CME-730		<b>13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN</b> 19 Jar	
<b>3. DRILLING AGENCY</b> US-CE-C		<b>14. TOTAL NUMBER CORE BOXES</b>		<b>15. ELEVATION GROUND WATER</b> 687.0	
<b>4. HOLE NO.</b> (As shown on drawing title and file number) 7		<b>16. DATE HOLE</b> STARTED 6/13/89 COMPLETED 6/13/89		<b>17. ELEVATION TOP OF HOLE</b> 726.62	
<b>5. NAME OF DRILLER</b> Ken Harmon		<b>18. TOTAL CORE RECOVERY FOR BORING</b>		<b>19. SIGNATURE OF INSPECTOR</b> Tom Hingler	
<b>6. DIRECTION OF HOLE</b> <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		<b>7. THICKNESS OF OVERBURDEN</b> 60.0		<b>8. DEPTH DRILLED INTO ROCK</b> 0.0	
<b>9. TOTAL DEPTH OF HOLE</b> 60.0					

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
726.6	0.0		Levee Fill (SM)	2x24		
	1.0	SM	Gravelly, Clayey, Silty Sand - loose - moist - Brown - Calcareous 60% Very Fine Sand 20% Silt 15% Clay 5% Fine, rounded and angular Gravel	P 4 S H E D		Notes: ① SPT = 140 lbs @ 20" drop ② Set 3" HSA to 5.0 ft.
	2.0			D 3.0 R 2.0 T 3.0 SPT 6	SH1 1.0 1.8	
	3.0			6		
	4.0			9		
722.1	4.5	ML	Silt (ML) - stiff - non plastic non elastic - uncemented - moist - Brown - Calcareous 90% Silt 5% Very Fine Sand 5% Clay	12		
721.0	5.0			D 3.0 R 2.0 T 3.0 SPT 6	SH2 4.5 5.0	
	6.0	ML	Gravelly, Sandy, Clayey Silt (ML) - medium soft stiff - non plastic, non elastic - uncemented - moist - Brown to gray - Calcareous 60% Silt 25% Clay 10% Very Fine sand 5% Fine, rounded Gravel	P 4 S H E D		③ Set 3" HSA to 10.0 ft.
	7.0			D 3.0 R 2.0 T 3.0 SPT 7	SH3 6.5 7.0	
	8.0			5		
718.0	8.6	ML	Silt (ML) - medium soft stiff - non plastic, non elastic - uncemented - moist - Brown, Calcareous 55% Silt 5% Clay	5 5 7	SH4 9.0 9.7	
716.6	10.0			D 3.0 R 2.0 T 3.0 SPT 7		

DIVISION **NCO** INSTALLATION **St. Paul District** **69-110**  
**DRILLING LOG** SHEET 1 OF 1 SHEETS  
 1. PROJECT **Chaska** 10. SIZE AND TYPE OF BIT  
 2. LOCATION (Coordinate or Station) 11. DAYUM FOR ELEVATION BROWN (YES or NO)  
 3. DRILLING AGENCY 12. MANUFACTURER'S DESIGNATION OF DRILL  
 4. HOLE NO. (As shown on drawing title and file number) 13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN DISTURBED UNDISTURBED  
 5. NAME OF DRILLER 14. TOTAL NUMBER CORE BOXES  
 6. DIRECTION OF HOLE 15. ELEVATION GROUND WATER  
☐ VERTICAL ☐ INCLINED \_\_\_\_\_ DEG. FROM VERT. 16. DATE HOLE STARTED COMPLETED  
 7. THICKNESS OF OVERBURDEN 17. ELEVATION TOP OF HOLE  
 8. DEPTH DRILLED INTO ROCK 18. TOTAL CORE RECOVERY FOR BORING  
 9. TOTAL DEPTH OF HOLE 19. SIGNATURE OF INSPECTOR *[Signature]*

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	3 CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
716.6	10.0	CL	(CL) <u>Gravelly, Sandy, Silty, Clay</u> - Soft to medium soft - non plastic <i>stff</i> - uncemented - moist - Brown-grey - Calcareous 50% Clay 30% Silt 18% Fine Sand 2% Fine, round Gravel	2x2x2 P 4 S H E D	SN5 10.2 10.6	
716.4	11.0					
	11.2					
	12.0					
	13.0	SM	(SM) <u>Gravelly, Silty Sand</u> - loose - uncemented - moist - Brown - Calcareous 60% Fine Sand 30% Silt 10% Fine Gravel	D 3.0 R 2.3 T 3.0 SPT 6 3 3 4 P 4 S H E D	SN6 16.0 16.8	
	14.0					
	15.0					
	16.0					
	17.0					
	18.0					
	19.0					
708.2	19.4		(CL-MU) <u>Sandy, Silty Clay</u> - Soft - low plasticity - moist - Brown 50% Clay 30% Silt 20% Fine Sand	D 3.0 R 2.3 T 3.0 SPT 3	SN7 18.4 18.8	⑤ Set 3" HSA to 20.0 ft.
707.8	19.8	CL-MU				
	20.0		<u>Gravelly, Sandy Silty Clay</u>	3		
			* see next page	6		
706.6	20.0	CL		10 D 3.0 R 2.3 T 3.0		

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No. 89-110M

<b>DRILLING LOG</b>		DIVISION <b>NCD</b>	INSTALLATION <b>St. Paul District</b>	SHEET <b>5</b> OF 7 SHEETS
1. PROJECT <b>Chaska</b>		10. SIZE AND TYPE OF BIT		
2. LOCATION (Coordinates or Station)		11. DAY OF YEAR FOR ELEVATION SHOWN (TREN or BRL)		
3. DRILLING AGENCY		12. MANUFACTURER'S DESIGNATION OF DRILL		
4. HOLE NO. (As shown on drawing title and file number)		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED UNDISTURBED
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES		
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER		
7. THICKNESS OF OVERBURDEN		16. DATE HOLE		STARTED COMPLETED
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE		
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING		
		19. SIGNATURE OF INSPECTOR <i>Tom Hargrave</i>		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	1. CORE RECOVERY e	2. BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
706.6	80.0		<u>Gravelly, Sandy Silty Clay (CL)</u> - Medium soft to stiff - non-plastic - uncemented - moist - Brown-grey-black	2x2x2		
	81.0	CL		P		
	82.0	SC		U		
	83.0	Test pits 110MM	60% Clay 20% Silt 10% Fine Sand 10% Fine, round Gravel Trace organic material - wood.	S		
	84.0			H		
	85.0			E	548	
	86.0			D	20.9 21.4	⑥ Set 3" HSA to 35.0 ft.
	87.0		<u>Sandy Clay (CL)</u> - medium soft to stiff - low plasticity - uncemented - moist, Calcareous - Brown to grey to black	0 30 R 2.6 T 28.0		
703.2	83.4			SPT		
	84.0	CL		6		
	85.0			6		
	86.0		70% Clay 19% Fine Sand 5% Silt 50% Fine, round Gravel 10% Wood fragments	9	549 24.0 24.5	
	87.0			8		
	88.0			R 2.0 T 28.0		
	89.0			2x2x2		
	90.0			P		
700.6	96.0		(CL) <u>Gravelly, Sandy Silt</u> - Soft to medium stiff - low plasticity, low elasticity - uncemented - moist - Brown to black - Calcareous	U		
	97.0	DL		S		
	98.0			H		
	99.0			E	540 26.0 26.6	⑦ Set 3" HSA to 30.0 ft.
	100.0			D		
	101.0			0 80 R 2.6 T 28.0		
798.6	102.0	SC	<u>Clayey Sand Seam</u> Brown, wet (SC)	SPT		
798.3	102.3			4		
	103.0		50% Silt 30% Fine Sand 15% Fine, round Gravel 5% Clay	4		
	104.0			4		
	105.0		<u>Stiff Silt (CL)</u> - stiff, moist, grey to black, - slightly clayey, slightly calcareous	5	541 26.6	
646.6	105.6	DL	95% Silt, 5% Organic debris.	6		

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### DRILLING LOG

1. PROJECT: Chaska

2. LOCATION (Coordinate or Station):

3. DRILLING AGENCY:

4. HOLE NO. (As shown on drawing title and site number):

5. NAME OF DRILLER:

6. DIRECTION OF HOLE:  
☐ VERTICAL ☐ INCLINED \_\_\_\_\_ DEG. FROM VERT.

7. THICKNESS OF OVERBURDEN:

8. DEPTH DRILLED INTO ROCK:

9. TOTAL DEPTH OF HOLE:

10. SIZE AND TYPE OF BIT:

11. DAYUM FOR ELEVATION SHOWN (728 - 728):

12. MANUFACTURER'S DESIGNATION OF DRILL:

13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN:    DISTURBED:    UNDISTURBED:

14. TOTAL NUMBER CORE BOXES:

15. ELEVATION GROUND WATER:

16. DATE HOLE:    STARTED:    COMPLETED:

17. ELEVATION TOP OF HOLE:

18. TOTAL CORE RECOVERY FOR BORING:    %

19. SIGNATURE OF INSPECTOR: [Signature]

### INSTALLATION

St Paul District

Hole No. 89-110M  
SHEET 5 OF 7 SHEETS

ELEVATION <small>a</small>	DEPTH <small>b</small>	LEGEND <small>c</small>	CLASSIFICATION OF MATERIALS <small>(Description)</small> <small>d</small>	CORE RECOVERY <small>e</small>	BOX OR SAMPLE NO. <small>f</small>	REMARKS <small>(Drilling time, water loss, depth of weathering, etc., if significant)</small> <small>g</small>	
686.6	40.0	OL	<u>Silty Clay</u> (a) cont. - Soft to medium soft - low plasticity - moist - grey - non-calcareous 70% Clay 20% Silt 10% Organic rootlets Trace small, mm-scale white, broken shells.	2x2x2	S114 435 440	⑩ Set 3" HSA to 45.0 ft	
							P
							U
							S
							H
							E
							D
681.6	45.0	OL	<u>Silty Clay</u> (a) - medium soft stiff - low plasticity - moist - Black - Calcareous 60% Clay 35% Silt 14% Peat 1% CaCO <sub>3</sub> shells	D 3.0 R 3.0 T 43.0 SPT 5	S115 450 455	⑪ Set 3" HSA to 50.0 ft.	
							6
							6
							P
							U
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							D
679.4	47.2	OL	<u>Clay</u> (a) - medium soft - low to medium plasticity - moist - black - non calcareous 95% Clay 4% silt 1% Peat material	D 3.0 R 2.5 T 42.0 SPT 7	S116 449 500		
							7
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							7
676.6	50.0						

BIG FORM 1836 MAR 71

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PROJECT Chaska

HOLE NO. 89-110M

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DRILLING LOG		DIVISION		INSTALLATION		SHEET	
1. PROJECT		NCD		St. Paul District		89-110M	
2. LOCATION (Coordinates or Station)		Chaska		10. SIZE AND TYPE OF BIT		11. DAY FOR ELEVATION SHOWN (TBN or BBL)	
3. DRILLING AGENCY				12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number)				13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED UNDISTURBED	
5. NAME OF DRILLER				14. TOTAL NUMBER CORE BOXES			
6. DIRECTION OF HOLE				15. ELEVATION GROUND WATER			
7. THICKNESS OF OVERBURDEN				16. DATE HOLE		STARTED COMPLETED	
8. DEPTH DRILLED INTO ROCK				17. ELEVATION TOP OF HOLE			
9. TOTAL DEPTH OF HOLE				18. TOTAL CORE RECOVERY FOR BORING		19. SIGNATURE OF INSPECTOR	
						Tom Hiple	
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)	
676.4	50.0		Clay cont. (CL)	2x2x2			
	51.0		Clay (CL) V. stiff	P			
	52.0	CL	- medium soft to stiff	U			
	53.0		- moderate plasticity	S			
	54.0		- moist	H			
	55.0		- light grey	E			
	56.0		- Non-calcareous	D			
	57.0		95% Clay				
	58.0		5% Silt				
	59.0			D 3.0			
	60.0			R 8.4			
	61.0			T 55.0			
	62.0			SPT			
	63.0			13			
673.0	58.6		Sand (SP)	9			
	59.0	SP	- medium dense	13			
	60.0		- uncemented				
	61.0		- saturated	16			
	62.0		- Brown, slightly calcareous	P 8.8			
	63.0		95% Fine Sand	R 8.8			
	64.0		5% Fine Gravel	T 55.0			
	65.0			2x2x2			
	66.0			20			
670.6	66.0		Gravelly Sand (SP)	56			
	67.0	SP	- medium dense				
	68.0		- wet	69			
	69.0		- uncemented				
	70.0		- Brown	D 3.0			
	71.0		- Calcareous	R 3.0			
	72.0		80% Fine to Medium Sand	T 55.0			
	73.0		20% Fine, rounded Gravel	SPT			
	74.0			12			
	75.0			14			
	76.0			20			
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DRILLING LOG			DIVISION <b>NCD</b>		INSTALLATION <b>St. Paul District</b>		Hole No. <b>89-110m</b>	
1. PROJECT <b>Chaska</b>			10. SIZE AND TYPE OF BIT		11. DATUM FOR ELEVATION SHOWN (FEET or MILES)		SHEET <b>7</b> OF 7 SHEETS	
2. LOCATION (Coordinate or Station)			12. MANUFACTURER'S DESIGNATION OF DRILL		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED    UNDISTURBED	
3. DRILLING AGENCY			14. TOTAL NUMBER CORE BOXES		15. ELEVATION GROUND WATER		16. DATE HOLE    STARTED    COMPLETED	
4. HOLE NO. (As shown on drawing title and file number)			17. ELEVATION TOP OF HOLE		18. TOTAL CORE RECOVERY FOR BORING		19. SIGNATURE OF INSPECTOR <b>Heinrich</b>	
5. NAME OF DRILLER			18. TOTAL CORE RECOVERY FOR BORING		19. SIGNATURE OF INSPECTOR		20. REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)	
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED    DEG. FROM VERT.			7. THICKNESS OF OVERBURDEN		8. DEPTH DRILLED INTO ROCK		9. TOTAL DEPTH OF HOLE	
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.			
			<p>Location</p>					

BRILLING LOG				DIVISION		INSTALLATION		SHEET	
1. PROJECT				NEB		St. Paul District		of 7 SHEETS	
2. LOCATION (Coordinates or Station)				Chaska Stage 3 Hwy 41 East CK		10. SIZE AND TYPE OF BIT 8" HSA, 2 1/2" R, 0.04 SPT		11. DAY USE FOR ELEVATION SHOWN (YES or NO)	
3. DRILLING AGENCY				See drawing, page 7		NGVD 1929 ADT		12. MANUFACTURER'S DESIGNATION OF DRILL	
4. HOLE NO. (As shown on drawing title and file number)				115-CE-C		CME-750		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	
5. NAME OF DRILLER				Ken Harmon		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED	
6. DIRECTION OF HOLE				<input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		13 Jar	
7. THICKNESS OF OVERBURDEN				60.0 ft		14. TOTAL NUMBER CORE BOXES		15. ELEVATION GROUND WATER	
8. DEPTH DRILLED INTO ROCK				0.0 ft		15. ELEVATION GROUND WATER		701.5 ft.	
9. TOTAL DEPTH OF HOLE				60.0 ft		16. DATE HOLE		STARTED	
						16. DATE HOLE		6/14/89	
						17. ELEVATION TOP OF HOLE		722.20 ft.	
						18. TOTAL CORE RECOVERY FOR BORING		%	
						19. SIGNATURE OF INSPECTOR		Tom Hupley	
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)			
722.2	0.0		Fill	2.0/2		60 ft.			
	1.0		Gravelly Silty Sand	P		Notes:			
	2.0		- loose to med. dense	U		① SPT = 140 lb E			
	3.0		- moist to slightly wet	S		20" drop			
	4.0		- Brown - blk at ie, buff	L					
	5.0		- Calcareous	E					
	6.0			D		② Set 8" HSA to 50 ft			
	7.0		60% Fine to medium Sand	P 3.0					
	8.0		20% Silt	R 1.0					
	9.0		20% Fine to Coarse Gravel	T 3.0					
	10.0		Trace pieces of wood	SPT					
718.2	4.0		Fill	9					
	5.0		Gravelly Rubbly, silty Sand	10					
	6.0		- loose med. dense	15					
	7.0		- damp to moist to wet	14					
	8.0		- Dark brown to buff colored white	P 3.0					
	9.0		50% Fine Sand	R 1.0					
	10.0		20% Silt	T 3.0					
	11.0		chunks of wood,	SPT					
	12.0		15% Round, Fine and coarse gravel	6					
	13.0			8					
	14.0			3					
	15.0			4					
712.2	12.0		(Dry)	4.0/4					

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PROJECT

Chaska Stage 4

HOLE NO.

29-111M

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DRILLING LOG			DIVISION NCO	INSTALLATION St. Paul District	Sheet No. 89-111M SHEET 5 OF 7 SHEETS	
1. PROJECT Chaska			10. SIZE AND TYPE OF BIT			
2. LOCATION (Coordinates or Station)			11. DATUM FOR ELEVATION SHOWN (FSM or MSL)			
3. DRILLING AGENCY			12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number)			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN			
5. NAME OF DRILLER			14. TOTAL NUMBER CORE BOXES			
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER			
7. THICKNESS OF OVERBURDEN			16. DATE HOLE			
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE			
9. TOTAL DEPTH OF HOLE			18. TOTAL CORE RECOVERY FOR BORING			
			19. SIGNATURE OF INSPECTOR Tom Hupler			
ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
713.2	10.0	SW-SM	Fill Gravelly, Rubbly, Silty Sand cont.	2x2 1/2	PUSHED	④ Set 3" HSA to 15.0 ft
	11.0		- loose			
	12.0		- moist to wet			
	13.0		- Dark brown - black - white - buff colored			
	14.0		50% Fine Sand	D 3.0 R 1.1 T 13.0		
	15.0		50% Silt	SPT 2		
	16.0		consisting of	2		
	17.0		organic material, pieces of wood, <del>etc.</del>	3		
	18.0		15% Fine to Coarse Gravel	5		
	19.0			R 1.0 R 1.0 T 15.0		
706.2	160	SM	Fill (SM) Gravelly, Silty Sand	2x2 1/2	PUSHED	⑤ Set 3" HSA to 80.0 ft.
	170		- loose			
	180		- moist			
	190		- black to grey to brown			
	200		- slightly Calcareous			
	210		60% Fine to Very Fine Sand	D 3.0 R 2.0 T 13.0		
	220		20% Silt	SPT 23		
	230		20% Fine to Coarse Gravel	8		
	240		Trace <del>etc.</del> and organic material (wood)	4		
	250			R 1.0 R 1.0 T 15.0		

DRILLING LOG			DIVISION		INSTALLATION		SHEET 3 OF 7 SHEETS	
1. PROJECT			NCD		St. Paul District			
2. LOCATION (Coordinate or Station)			Chaska		10. SIZE AND TYPE OF BIT		11. DATUM FOR ELEVATION SHOWN (TBM or BBL)	
3. DRILLING AGENCY					12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number)					13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED UNDISTURBED	
5. NAME OF DRILLER					14. TOTAL NUMBER CORE BOXES			
6. DIRECTION OF HOLE			<input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER			
7. THICKNESS OF OVERBURDEN					16. DATE HOLE		STARTED COMPLETED	
8. DEPTH DRILLED INTO ROCK					17. ELEVATION TOP OF HOLE			
9. TOTAL DEPTH OF HOLE					18. TOTAL CORE RECOVERY FOR BORING			
					19. SIGNATURE OF INSPECTOR		Tom Hipler	
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)		% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)	
702.8	20.0	SM	Fill	Gradational	3M	2X2 1/2		
			Gravelly, Silty Sand					
701.5	20.7		- loose			P		
	21.0		- moist			U		
			- Black to brown to grey			S		
			<del>Black to brown</del>			H		
			- Slightly Calcareous			E		
			60% Fine to Very Fine Sand			D		
			20% Silt			3.0		
699.2	28.0	SM	100% Fine to Coarse gravel			R 0.2		
			10% Organic debris			T 2.0		
			Fill (SM)			SPT		
			Rubbly, Silty Sand			1		
			- loose			2		
			- wet to saturated			1		
			- black			6		
			- no odor, but			R 3.8		
			- slightly Calcareous			T 2.0		
			60% Fine Sand			2X2 1/2		
			30% Silt			28		
			60% Fine Sand			9		
			30% Silt			11		
			Rubbly, Boulders, wood fragments			3		
			Silty Clay (CL)			2		
			- soft med stiff			3		
			- non-plastic, non elastic			2		
			- unconsolidated, moist to wet, grey, organic odor,			3		
			- Non calcareous			3		
698.7	24.6		70% Clay			3		
698.2	30.0	CL	80% Silt			3		

File No. 82-111M

<b>DRILLING LOG</b>		DIVISION <b>NCD</b>	INSTALLATION <b>St. Paul District</b>	SHEET 4 OF 7 SHEETS
1. PROJECT <b>Chaska</b>		10. SIZE AND TYPE OF BIT		
2. LOCATION (Coordinate or Station)		11. DAYUM FOR ELEVATION SHOWN (FWS - MSL)		
3. DRILLING AGENCY		12. MANUFACTURER'S DESIGNATION OF DRILL		
4. HOLE NO. (As shown on drawing title and site number)		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED UNDISTURBED
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES		
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER		
7. THICKNESS OF OVERBURDEN		16. DATE HOLE		STARTED COMPLETED
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE		
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING		
		19. SIGNATURE OF INSPECTOR <i>Im Hupelger</i>		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
698.2	30.0	CL	<u>Silty Clay</u> (CL) cont.	2x2 1/2		
	31.0		- Soft - Nonplastic - uncemented - moist to wet - Grey - Non calcareous - Organic odor	P U S H E D		(10) Clear hole to 35.0' with 2 3/8" roller bit.
	32.0		70% Clay 30% Silt			- Water loss approx. 0 gal/min
	33.0	CL	Contact between 30.0' & 33.0'	P 30.0 R 30.0 T 33.0		
689.8	33.0	OH	<u>Organic Clay</u> (OH)	SPT		(11) No recovery between 30.0 and 33.0'. Basket in sampler fell out. Unsure about accuracy of contact at 33.0 ft.
	34.0		- <del>very</del> med stiff - moderate plasticity - moist to wet - Black to dark grey - Non calcareous	5 4 4	548 33.5 34.0	
	35.0		85% Clay 15% Undecomposed plant fibers	6 P 35.0 R 35.0 T 35.0		
	36.0			2x2 1/2		(12) Clear hole to 40.0 ft with 2 3/8" roller bit
	37.0	OH		P U S H E D		- Water loss approximately 5 gal/min
	38.0			P 38.0 R 38.0 T 38.0		
	39.0			SPT		(13) No recovery between 38.0 and 40.0 due to broken basket.
	40.0			3 3 3 4 P 40.0 R 40.0 T 40.0	549 32.0 37.4	
682.2	40.0		↓ Same			

DRILLING LOG			DIVISION		INSTALLATION		SHEET	
1. PROJECT			NCO		St. Paul District		82-111 W	
2. LOCATION (Coordinates or Station)			Chaska		10. SIZE AND TYPE OF BIT		11. DAYUM FOR ELEVATION SHOWN (FSM or MSL)	
3. DRILLING AGENCY					12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number)					13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED UNDISTURBED	
5. NAME OF DRILLER					14. TOTAL NUMBER CORE BOXES		15. ELEVATION GROUND WATER	
6. DIRECTION OF HOLE			<input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		16. DATE HOLE		STARTED COMPLETED	
7. THICKNESS OF OVERBURDEN					17. ELEVATION TOP OF HOLE			
8. DEPTH DRILLED INTO ROCK					18. TOTAL CORE RECOVERY FOR BORING		S	
9. TOTAL DEPTH OF HOLE					19. SIGNATURE OF INSPECTOR		Tom Hiplerger	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)		
a	b	c	d	e	f	g		
685.2	40.0	OH	Organic Clay (OH) * See previous description  Approximate contact	2x2x	PUSHED			
681.7	40.5							
	41.0							
	42.0							
	43.0							
	44.0							
	45.0	SPSM	Sand (SPSM) - loose - uncemented - saturated - light grey - brown - Slightly Calcareous  89% Fine to Medium Sand 10% Silt 1% Fine Gravel	27	SWID 430 44.0	(14) Clean hole to 45.0 ft with 2 3/8" Roller Bit  Water loss: approx. 1 gal/min		
				24				
				30 R 0.9 T 43.0				
				SPT				
				2				
				3				
				7				
				9 2.0 1.1 45.0				
677.2	46.0	SM	Approximate Contact  Silty Sand (SM) - medium dense - wet to saturated - uncemented - light grey to brown - Calcareous  80% Fine Sand 20% Silt	2x2x			74	(15) Note poor recoveries between 40.0' and 50.0'. Reasons unknown. New baskets installed each drive.  (16) Clean hole to 50.0 ft with 2 3/8" Roller Bit  Water loss: approx. 1 gal/min
	46.5							
	47.0					60		
						30 R 0.0 T 48.0		
	48.0					SPT		
						25		
						25		
	49.0					28		
						33		
678.2	50.0			SM				

DRILLING LOG			DIVISION NED	INSTALLATION Chaska	SHEET OF 7 SHEETS	
1. PROJECT Chaska			10. SIZE AND TYPE OF BIT			
2. LOCATION (Coordinates or Station)			11. DAY FOR ELEVATION SHOWN (TYP. or REG.)			
3. DRILLING AGENCY			12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number)			13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN			
5. NAME OF DRILLER			14. TOTAL NUMBER CORE BOXES			
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			15. ELEVATION GROUND WATER			
7. THICKNESS OF OVERBURDEN			16. DATE HOLE			
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE			
9. TOTAL DEPTH OF HOLE			18. TOTAL CORE RECOVERY FOR BORING			
			19. SIGNATURE OF INSPECTOR			
ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
672.2	50.0	SM	(SM) <u>Silty Sand</u> cont.  - medium dense - uncemented - wet to saturated - light-green to brown  80% Fine Sand 20% Silt  Color change to brown	20 1/2 40  48 50 D 3.0 R 0.0 T 0.0 SPT 11	SH12 54.0 55.0	(17) Clean hole to 550' with 2 3/8" Roller Bit  - Water loss: Approx gal/min  - No water loss 1000' min
668.4	58.8 54.0	SW	(SW) <u>Gravelly Sand</u>  - medium dense - uncemented - wet - brown - calcareous  80% Fine through Coarse Sand 15% Fine, rounded Gravel 5% Silt	12 15 18 D 3.0 R 0.0 T 0.0 20 1/2 28 50		
665.0	57.2			50		
	50.0	SW	(SW) <u>Gravelly Sand</u>  - medium dense - uncemented - wet - brown - calcareous  70% Fine through Coarse Sand 30% Fine, rounded Gravel	15 20 25 31 D 3.0 R 0.0 T 0.0	SH13 58.5 59.0	
662.2	60.0					(18) Backfill hole:  - Pump in grout mix: 50 gals. water 20 lbs. bentonite 180 lbs cement

DRILLING LOG			DIVISION		INSTALLATION		Hole No. 89-111 M	
1. PROJECT			2. LOCATION (Coordinate or Station)		10. SIZE AND TYPE OF BIT		11. DATUM FOR ELEVATION SHOWN (TBM or BBL)	
3. DRILLING AGENCY			4. HOLE NO. (As shown on drawing title and file number)		12. MANUFACTURER'S DESIGNATION OF DRILL		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	
5. NAME OF DRILLER			6. DIRECTION OF HOLE		14. TOTAL NUMBER CORE BOXES		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN			8. DEPTH DRILLED INTO ROCK		16. DATE HOLE		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE			18. TOTAL CORE RECOVERY FOR BORING		19. SIGNATURE OF INSPECTOR		20. REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)	
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)		
662.2	60.0		End of Boring					
			Location:					
			Waste treatment plant.					
			Dike					
			City Storage area					
			Courthouse lake					
			N					

DRILLING LOG		INSTALLATION		SHEET		
1. PROJECT <b>Chaska</b>		2. LOCATION (Coordinate or Station) <b>See drawing, page 4</b>		3. DRILLING AGENCY <b>US-CE-C</b>		
4. HOLE NO. (As shown on drawing title and file number) <b>#6 (Second 46)</b>		5. NAME OF DRILLER <b>Ken Harman</b>		6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		
7. THICKNESS OF OVERBURDEN <b>80.0 ft.</b>		8. DEPTH DRILLED INTO ROCK <b>0.0 ft.</b>		9. TOTAL DEPTH OF HOLE <b>30.0 ft.</b>		
10. SIZE AND TYPE OF BIT <b>5" HSA, 2 1/2" E.S. 200, 3"</b>		11. DATE FOR ELEVATION SHOWN (Yr-Mo-Dy) <b>NOV 19 1989 ADT</b>		12. MANUFACTURER'S DESIGNATION OF DRILL <b>CME-750</b>		
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN <b>9 Jar</b>		14. TOTAL NUMBER CORE BOXES <b>701.2</b>		15. ELEVATION GROUND WATER <b>701.2</b>		
16. DATE HOLE <b>7/26/89</b>		17. ELEVATION TOP OF HOLE <b>707.83</b>		18. TOTAL CORE RECOVERY FOR BORING <b>3</b>		
19. SIGNATURE OF INSPECTOR <b>Tom Hines</b>		20. SIGNATURE OF DRILLER <b>Ken Harman</b>		21. SIGNATURE OF WITNESS <b>Ken Harman</b>		
ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	1 CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
707.0	0.0		<b>Fill</b> (sm) <b>Rubblly, Clayey Silty Sand</b> - loose - moist - brown to black - calcareous	2x2 1/2		Notes:  C SPT = 140 cc @ 30" trip  ② Jet 3' - 5.8' to 5.0'
705.2	1.8	sm	<b>45% Fine Sand</b> <b>25% Silt</b> <b>15% Clay</b> <b>pieces of wood and organic debris</b>	D 3.0 R 2.8 T 3.0 SPT 30/4.0	SM1 0.3/1.5	
	3.0	sm	<b>Fill</b> (sm) <b>Silty Sand</b> - loose - calcareous - moist - brown <b>70% Fine Sand</b> <b>30% Silt</b>	2		
702.4	4.6	CH	<b>Clay</b> (CH) - very soft - moderate to high plasticity - wet - green, calcareous	1		
702.2	4.8	sm	<b>100% Clay</b> (Sample contains some sand) <b>Gravelly Silty Sand</b> (sm) - loose, wet, dark-brown - calcareous <b>70% Fine to med. Sand</b> <b>20% Silt</b> <b>10% Fine, rounded Gravel</b>	D 3.0 R 3.0 T 3.0 SPT 46/4.8	SM3	③ Water level: 8:00 5.8 0 min 5.8 20 min 5.8 40 min - Hole open to 6.6 ft. - Drive Sample to 9.4 ft. - Jet HSA to 9.0' - mix drilling mud: - 40 gal water - 30 lbs bentonite - 12 oz T-100  ④ Clean hole to 10.0' with 2 1/2" Roller Bit - No water loss in fo. - Good water return  Note: Small piece of [redacted] recovered in standard Barrel.
702.0	5.0	SC	<b>Clay</b> (CH) - very soft - moderate to high plasticity - wet - green, calcareous	2x2 1/2		
701.2	5.8		<b>100% Clay</b> (Sample contains some sand) <b>Gravelly Silty Sand</b> (sm) - loose, wet, dark-brown - calcareous <b>70% Fine to med. Sand</b> <b>20% Silt</b> <b>10% Fine, rounded Gravel</b>	1		
	6.0	SC	<b>100% Clay</b> (Sample contains some sand) <b>Gravelly Silty Sand</b> (sm) - loose, wet, dark-brown - calcareous <b>70% Fine to med. Sand</b> <b>20% Silt</b> <b>10% Fine, rounded Gravel</b>	2		
	7.0	SC	<b>100% Clay</b> (Sample contains some sand) <b>Gravelly Silty Sand</b> (sm) - loose, wet, dark-brown - calcareous <b>70% Fine to med. Sand</b> <b>20% Silt</b> <b>10% Fine, rounded Gravel</b>	1		
	8.0		<b>Fill</b> (sc) <b>Rubblly, Silty Clayey Sand</b> - loose - saturated - orange to white - calcareous	D 3.0 R 0.7 T 8.0 SPT 16	SM5 5.0/5.7	
	9.0		<b>45% Fine to Medium Sand</b> <b>30% Clay</b> <b>10% Silt</b>	21		
697.6	24	Drill	<b>Drill</b>	18.7 1.9 2.2 2.4		

DRILLING LOG		DIVISION NCD		INSTALLATION St. Paul District		SHEET 2 OF 4 SHEETS	
1. PROJECT Chaska				10. SIZE AND TYPE OF BIT			
2. LOCATION (Coordinates or Station)				11. DATUM FOR ELEVATION SHOWN (TBM or BBL)			
3. DRILLING AGENCY				12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number)				13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED UNDISTURBED	
5. NAME OF DRILLER				14. TOTAL NUMBER CORE BOXES			
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.				15. ELEVATION GROUND WATER			
7. THICKNESS OF OVERBURDEN				16. DATE HOLE STARTED COMPLETED			
8. DEPTH DRILLED INTO ROCK				17. ELEVATION TOP OF HOLE			
9. TOTAL DEPTH OF HOLE				18. TOTAL CORE RECOVERY FOR BORING			
				19. SIGNATURE OF INSPECTOR Tom Hurler			
ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g	
697.0	10.0		Rubblly silty clayey Sand (SC) See previous description Contact between 8.0 ft and 10.0 ft.	2x2x		⑤ Pe-er 2" HCR to 14.0 ft.	
	11.0	OH	floodplain (OH) Silty Clay - less soft to soft - moderate plasticity - wet - black - calcareous - contains traces of broken, white carbonate shells, mm-scale - also contains semi-decomposed plant roots	P U S H E D	546 13.5 14.5	⑥ Clean hole to 15.0 ft. with 2 3/8" Roller Bit - Water loss: 1 gal/min	
	12.0			0 3.0 R 3.0 T 13.0			
	13.0	CH		SPT 1			
	14.0			0			
	15.0	OH	70% Clay 30% Silt	1 0 3.0 R 3.0 T 13.0		⑦ Clean hole to 20.0' with 2 3/8" Roller Bit - water loss: 1 gal/min	
	16.0			2x2x			
	17.0			P U S H E D	SPT 18.5 19.5		
	18.0		- broken shell material disappears below 17.5 ft.	0 3.0 R 3.0 T 13.0			
	19.0			SPT 1			
	20.0	OH		1			
697.0	20.0			1 0 3.0 R 3.0 T 13.0			



<b>DRILLING LOG</b>		<b>STATION</b> NCD		<b>INSTALLATION</b> St. Paul District		<b>SHEET 3</b> OF 4 SHEETS	
<b>1. PROJECT</b> Chaska				<b>10. SIZE AND TYPE OF BIT</b>			
<b>2. LOCATION (Coordinate or Station)</b>				<b>11. DATUM FOR ELEVATION SHOWN (TBM or BM)</b>			
<b>3. DRILLING AGENCY</b>				<b>12. MANUFACTURER'S DESIGNATION OF DRILL</b>			
<b>4. HOLE NO. (As shown on drawing title and file number)</b>				<b>13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN</b>		<b>DISTURBED</b>	<b>UNDISTURBED</b>
<b>5. NAME OF DRILLER</b>				<b>14. TOTAL NUMBER CORE BOXES</b>			
<b>6. DIRECTION OF HOLE</b> <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.				<b>15. ELEVATION GROUND WATER</b>			
<b>7. THICKNESS OF OVERBURDEN</b>				<b>16. DATE HOLE</b>		<b>STARTED</b>	<b>COMPLETED</b>
<b>8. DEPTH DRILLED INTO ROCK</b>				<b>17. ELEVATION TOP OF HOLE</b>			
<b>9. TOTAL DEPTH OF HOLE</b>				<b>18. TOTAL CORE RECOVERY FOR BORING</b>			
				<b>19. SIGNATURE OF INSPECTOR</b> Tom Klingenberg			

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
687.0	20.0		(OH)	2x24		
			Silty Clay	P		
			cont.	U		
	21.0	OH	- Very soft to soft	S		
			- moderate plasticity	H		
			- wet	E		
	22.0		- black	D		
			- calcareous			
			70% Clay			
			30% Silt			
	23.0	CH		D 3.0	308	
				R 3.0	23.5	
				T 20.0	24.5	
				SPT		
			- contains traces of	1		
			semi-decomposed plant			
			remains	1		
	24.0		- Shells appear again			
			at 24.5 ft.			
	25.0	OH		1		
				D 3.0		
				R 3.0		
				T 25.0		
				2x24		
				P		
				U		
	26.0			S		
				H		
				E		
	27.0			D		
	28.0					
				D 3.0		
				R 3.0		
				T 28.0		
				SPT		
				0		
	29.0			1		
				2		
				2		
677.0	30.0	OH	End of Boring			

DRILLING LOG		INSTALLATION	
1. PROJECT <b>Chaska</b>		St. Paul District	
2. LOCATION (Coordinates or Station)		10. SIZE AND TYPE OF BIT	
3. DRILLING AGENCY		11. DAYUM FOR ELEVATION SHOWN (TBM or BML)	
4. HOLE NO. (As shown on drawing title and file number)		12. MANUFACTURER'S DESIGNATION OF DRILL	
5. NAME OF DRILLER		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		14. TOTAL NUMBER CORE BOXES	
7. THICKNESS OF OVERBURDEN		15. ELEVATION GROUND WATER	
8. DEPTH DRILLED INTO ROCK		16. DATE HOLE	
9. TOTAL DEPTH OF HOLE		17. ELEVATION TOP OF HOLE	
		18. TOTAL CORE RECOVERY FOR BORING	
		19. SIGNATURE OF INSPECTOR	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVER- ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			<p><u>Location:</u></p> <p>Note: Boring 89-126m is straight down-hill from boring 89-111m at elev. 707.03 ft.</p> <p>Storage lot</p> <p>Boring # 89-111m elev. 722.2</p> <p>Boring # 89-126m elev. 707.0</p> <p>Waste Treatment Plant</p> <p>Dike</p> <p>Slope</p> <p>Flat Area</p> <p>Courthouse Lake</p> <p>N</p>			

ENG FORM 1836  
MAR 71

PREVIOUS EDITIONS ARE OBSOLETE.  
(TRANSLUCENT)

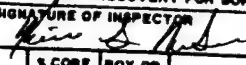
PROJECT

Chaska B-54

HOLE NO.

89-126m

DRILLING LOG		DIVISION		INSTALLATION		SHEET	
PROJECT		NCD		NCS		OF 11 SHEETS	
1. PROJECT		Chaska - Stage 3		10. SIZE AND TYPE OF BIT		SPT-2x2 1/2 - HSA-3x3 RB	
2. LOCATION (Coordinates or Station)		See Sheet # 10		11. DAYUM FOR ELEVATION SHOWN (Top of Bore)		NGVD - 1929 - ADJ	
3. DRILLING AGENCY		US-CE-C		12. MANUFACTURER'S DESIGNATION OF DRILL		CME-750	
4. HOLE NO. (As shown on drawing title and file number)		4		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED 17-Jar UNDISTURBED	
5. NAME OF DRILLER		AL Seipel		14. TOTAL NUMBER CORE BOXES		N/A	
6. DIRECTION OF HOLE		<input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER		N/A Not Determined	
7. THICKNESS OF OVERBURDEN		85.0'		16. DATE HOLE		STARTED 3/4/92 COMPLETED 3/5/92	
8. DEPTH DRILLED INTO ROCK		—		17. ELEVATION TOP OF HOLE		725.38	
9. TOTAL DEPTH OF HOLE		85.0'		18. TOTAL CORE RECOVERY FOR BORING		1	
				19. SIGNATURE OF INSPECTOR		[Signature]	
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)	
725.3	0.0		FFH Silty Clay (CL)	2x2 1/2		SPT = 140 lbs @ 30' Drop	
	1.0		- U. Soft	P		HSA = 4" ID. Hollow Stem Auger	
	2.0		- M. Plasticity	U		W/RB = with 3/8" Roll-on Bit	
	3.0		- Wet-Saturated	S		Boring done in	
	4.0		- White-Gray	H		Lime pile Near	
	5.0	CL	- Some clayey layers (F&K) To Acid (colorless)	D 3.0 R 2.2 T 3.0		Sugar plant	
	6.0		- Brit. Plastic	SPT		Lime smell is from processing	
	7.0		- Residue Layered (Lacustrine)	0			
	8.0		70% Clay	0			
	9.0		2-1/2 Silt	0			
	10.0		10% organics	0			
	11.0			0			
	12.0			0			
	13.0			0			
	14.0			0			
	15.0			0			
	16.0			0			
	17.0			0			
	18.0			0			
	19.0			0			
	20.0			0			
	21.0			0			
	22.0			0			
	23.0			0			
	24.0			0			
	25.0			0			
	26.0			0			
	27.0			0			
	28.0			0			
	29.0			0			
	30.0			0			
	31.0			0			
	32.0			0			
	33.0			0			
	34.0			0			
	35.0			0			
	36.0			0			
	37.0			0			
	38.0			0			
	39.0			0			
	40.0			0			
	41.0			0			
	42.0			0			
	43.0			0			
	44.0			0			
	45.0			0			
	46.0			0			
	47.0			0			
	48.0			0			
	49.0			0			
	50.0			0			
	51.0			0			
	52.0			0			
	53.0			0			
	54.0			0			
	55.0			0			
	56.0			0			
	57.0			0			
	58.0			0			
	59.0			0			
	60.0			0			
	61.0			0			
	62.0			0			
	63.0			0			
	64.0			0			
	65.0			0			
	66.0			0			
	67.0			0			
	68.0			0			
	69.0			0			
	70.0			0			
	71.0			0			
	72.0			0			
	73.0			0			
	74.0			0			
	75.0			0			
	76.0			0			
	77.0			0			
	78.0			0			
	79.0			0			
	80.0			0			
	81.0			0			
	82.0			0			
	83.0			0			
	84.0			0			
	85.0			0			

DRILLING LOG		Division		Installation		Hole No. 92-11721A	
PROJECT		NCD		NCS		SHEET 2 OF 1 SHEETS	
LOCATION (Coordinates or Station)		Chaska - Stage 3		10. SIZE AND TYPE OF BIT		11. DAYUM FOR ELEVATION BROWN (TBM - IN)	
1. DRILLING AGENCY				12. MANUFACTURER'S DESIGNATION OF DRILL			
2. HOLE NO. (As shown on drawing title and site number)				13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED UNDISTURBED	
3. NAME OF DRILLER				14. TOTAL NUMBER CORE BOXES			
4. DIRECTION OF HOLE				15. ELEVATION GROUND WATER			
<input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.				16. DATE HOLE		STARTED COMPLETED	
7. THICKNESS OF OVERBURDEN				17. ELEVATION TOP OF HOLE			
8. DEPTH DRILLED INTO ROCK				18. TOTAL CORE RECOVERY FOR BORING		1	
9. TOTAL DEPTH OF HOLE				19. SIGNATURE OF INSPECTOR			
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SCORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)	
715.3	10.0						
	11.0	CL	Fill Silty Clay Cont (CL) - V. Soft - M. Plasticity - Wet-saturated - Gray w/ some black - Strong Reaction w/ Acid (Calcium) - Occasional Root System 79% Clay 20% SiO <sub>2</sub> 1% Org.	2x2 1/2			
	12.0			P			
	13.0			U			
	14.0			C			
	15.0			H			
	16.0			D 3.0 R 2.3 T 13.0			
	17.0			SPT			
	18.0			1			
	19.0			0	SN3		
	20.0			0	13.0		
	21.0			0	15.0		- Set HSA to 15.0'
	22.0			0			
	23.0			R 2.0 R 1.8 T 15.0			
	24.0			2x2 1/2			
	25.0			P			
	26.0			U			
	27.0						
	28.0	CL		S			
	29.0			H			
	30.0			D 3.0 R 2.3 T 15.0			
	31.0			SPT			
	32.0			1			
	33.0			0	SN4		
	34.0			0	18.0		
	35.0			0	20.0		- Set HSA TO 20.0'
	36.0			0			
	37.0			0			
	38.0			0			
	39.0			0			
	40.0			0			
	41.0			0			
	42.0			0			
	43.0			0			
	44.0			0			
	45.0			0			
	46.0			0			
	47.0			0			
	48.0			0			
	49.0			0			
	50.0			0			
	51.0			0			
	52.0			0			
	53.0			0			
	54.0			0			
	55.0			0			
	56.0			0			
	57.0			0			
	58.0			0			
	59.0			0			
	60.0			0			
	61.0			0			
	62.0			0			
	63.0			0			
	64.0			0			
	65.0			0			
	66.0			0			
	67.0			0			
	68.0			0			
	69.0			0			
	70.0			0			
	71.0			0			
	72.0			0			
	73.0			0			
	74.0			0			
	75.0			0			
	76.0			0			
	77.0			0			
	78.0			0			
	79.0			0			
	80.0			0			
	81.0			0			
	82.0			0			
	83.0			0			
	84.0			0			
	85.0			0			
	86.0			0			
	87.0			0			
	88.0			0			
	89.0			0			
	90.0			0			
	91.0			0			
	92.0			0			
	93.0			0			
	94.0			0			
	95.0			0			
	96.0			0			
	97.0			0			
	98.0			0			
	99.0			0			
	100.0			0			



DRILLING LOG		DIVISION NCO	INSTALLATION NCS	SHEET # OF 16 SHEETS		
PROJECT <b>Chaska - Stage 3</b>			10. SIZE AND TYPE OF BIT			
LOCATION (Coordinates or Station)			11. DAYTON FOR ELEVATION SHOWN (758' or 798')			
1. DRILLING AGENCY			12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number)			13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN	DISTURBED UNDISTURBED		
2. NAME OF DRILLER			14. TOTAL NUMBER CORE BOXES			
			15. ELEVATION GROUND WATER			
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.			16. DATE HOLE STARTED	COMPLETED		
7. THICKNESS OF OVERBURDEN			17. ELEVATION TOP OF HOLE			
8. DEPTH DRILLED INTO ROCK			18. TOTAL CORE RECOVERY FOR BORING			
9. TOTAL DEPTH OF HOLE			19. SIGNATURE OF INSPECTOR			
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
695.3	30.0	c				
		PT	prob organic clay (PT) Cont. - soft - M. Stiff - Moist - Black to Brown - Shells Plant Matter Reacts w/ Acid Strongly - Some Replacement w/ CaCO <sub>3</sub> at Depth More Replacement the Deeper	2x2 1/2 P U S H		
	31.0			P 3.0 R 3.0 T 33.0 SPT	SNB	
	32.0			I	33.0 / 35.0	
	33.0		55% Clay 40% Organics 5% CaCO <sub>3</sub> Gradational Change			
691.8	33.5		sand like Organic Clay	I		
	34.0	OL	- soft - M. Stiff - wet - saturated - Black - Brown - Peat in seams - sand like CaCO <sub>3</sub> Replacement product? - Plant Fibers - shells	2 J P 2.0 R 3.0 T 35.0 2x2 1/2		- Clean Hole to 35.0' w/RB
	35.0		50% Clay 47% sandlike stuff 3% organics	P U S H		
	36.0			P 3.0 R 3.0 T 35.0 SPT	2N9	
	37.0			I	38.0	
	38.0			O	40.0	
	39.0			O		
685.3	40.0			P 3.0 R 3.0 T 35.0 SPT		- Clean Hole to 40.0' w/RB

Hole No. 612-1724		DIVISION NCD		INSTALLATION NCS		SHEET 10 OF 10 SHEETS	
LOCATION (Coordinate or Address)				10. SIZE AND TYPE OF BIT			
11. NAME OF AGENCY				12. NAME OF PERSONS & DESIGNATION OF DRILL			
13. HOLE NO. (As shown on drawing title and on map)				14. TOTAL NO. OF OVER-BORES, SAMPLES, TAKEN		15. ELEVATION GROUND WATER	
16. NAME OF DRILLER				17. ELEVATION TOP OF HOLE		18. TOTAL CORE RECOVERY FOR BORING	
19. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.				20. DATE HOLE STARTED		21. DATE HOLE COMPLETED	
22. THICKNESS OF OVERBURDEN				23. SIGNATURE OF INSPECTOR		24. SIGNATURE OF DRILLER	
25. DEPTH DRILLED INTO ROCK				26. SIGNATURE OF INSPECTOR		27. SIGNATURE OF DRILLER	
28. TOTAL DEPTH OF HOLE				29. SIGNATURE OF INSPECTOR		30. SIGNATURE OF DRILLER	
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)	
685.3	40.0						
	41.0	OL	Sand Like organic clay (OL) cont. - V. Soft - L. Plasticity - Wet saturated - L. Brown w/ Black Brown organics - Shells Plant Matter - Sand Like Replacement 52% Clay 45% Sand Like Particles 3% Organics	2x2 1/2 P 4 S H S Shape D 3.0 R 2.7 T 43.0 SPT 1 0 1 1 2.0 45.0 2x2 1/2 D			
	42.0						
	43.0						
	44.0						
	45.0						
	46.0						
	47.0	OL	Sharp Clay Silt (ML) - Soft - L. Plasticity - Moist - Wet - Gray - Contains 1/8" organic seams 2% (Plant matter) - mod. Acid Reaction 68% Silt 30% Clay 2% organics (Seed)	4 S H 3.0 2.7 43.0 SPT 0 1 1 1 2.0 45.0 2x2 1/2 D			
	48.0						
	49.0						
	49.2						
676.1	49.2						
	50.0	ML					
675.3	50.0						

Hole No. 92-172M

HILLING LOG		DIVISION <b>NCD</b>		INSTALLATION <b>NCS</b>		SHEET <b>2210 SHEETS</b>	
PROJECT <b>Chaska - Stage 3</b>				H. SIZE AND TYPE OF BIT			
LOCATION (Coordinates or Station)				I. DATE FOR ELEVATION SHOWN (TIME or AM)			
J. DRILLING AGENCY				K. MANUFACTURE'S DESIGNATION OF DRILL			
L. HOLE NO. (As shown on drawing title and site number)				M. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		N. DISTURBED	
O. NAME OF DRILLER				P. TOTAL NUMBER CORE BOXES		Q. ELEVATION GROUND WATER	
R. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.				S. DATE HOLE		T. STARTED	
U. THICKNESS OF OVERBURDEN				V. ELEVATION TOP OF HOLE		W. TOTAL CORE RECOVERY FOR BORING	
X. DEPTH DRILLED INTO ROCK				Y. SIGNATURE OF INSPECTOR <i>Kim S. M...</i>		Z. COMPLETED	
AA. TOTAL DEPTH OF HOLE							

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	S. CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc.; if significant)
675.3	50.0					
675.2	50.1	PT	Clay Organics (PD) - M. Stiff - Spongy - Moist wet - Black Brown - wood & plant matter 70% Organics 30% clay	2x2 1/2 P		
	51.0			U		
	52.0			S		- 2x2 1/2 Blocked By Pine Log
	53.0			N		
	53.2		Clay Silt Seam (ML) - M. Stiff - Moist - wet - L. Plasticity - Gray 85% Silt 15% clay	3.0 R 1.5 T 53.0 SPT 3	SNR 53.0 54.9	
	54.0			4		
	54.2			4		
670.4	54.9			7.0 R 2.0 T 55.0 2x2 1/2		
	55.0	ML	Silty Gravelly Sand (SP-SM) - Dense - Saturated - Brown 50% Sand (M to C) 40% Gravel (F to C) 10% Silt	8		
670.0	55.3	SP-SM		32		- 2x2 1/2 Blocked Large Gravel
	56.0					
	57.0			20		
	58.0			3.0 R 1.2 T 58.0 SPT 40	SNB 58.0 60.0	
	59.0			33		
	60.0			20		
	61.0			3.0 R 1.3 T 61.0		- Clean Hole to 60.0 w/ RB - Add 20 lbs Bentonite - V. Rub & Brn action

ENGINEERING FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

B-60



[illegible]

Hole No. 92-17224

LOGGING LOG		DIVISION	INSTALLATION	SHEET		
PROJECT				OF 10 SHEETS		
Chaska - Stage 3		10CD	St. Paul District			
LOCATION (Coordinate or Station)						
1. DRILLING AGENCY		12. MANUFACTURER'S DESIGNATION OF DRILL				
4. HOLE NO. (As shown on drawing side and file marked)		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		DISTURBED	UNDISTURBED	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES				
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER				
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED COMPLETED				
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE				
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING				
		19. SIGNATURE OF INSPECTOR				
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
655.3	70.0					
655.3		SP-SM	Silty Gravelly Sand (SP-SM)			
			- M. Dense	37		
			- Saturated			
			- Tan Brown			
	71.0		80% Sand M to C	27		
			10% Gravel (F)			
			10% Silt			
	72.0			38		
				D 3.0		
				R 2.3		
				T 73.0		
	73.0			SPT 7	SN10	
					73.0	
					75.0	
	74.0			10		
				10		
				12		
				D 2.4		
				R 4.5		
	75.0			T 75.0		
				2 1/2		
				15		
	76.0	SP-SM				
				26		
	77.0					
				24		
				D 3.0		
				R 1.6		
	78.0			T 78.0		
				SPT 3	SN16	
					78.0	
					80.0	
	79.0			7		
				7		
				D 2.0		
				R 1.3		
				T 78.0		
645.3	80.0					

ENGINE FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT

Chaska - Stage B3

HOLE NO.

92-17224

B-62





Hole No. 92-173M

<b>DRILLING LOG</b>		<b>DIVISION</b> NCD	<b>INSTALLATION</b> NCBS	<b>SHEET</b> 7 of 7 SHEETS
<b>1. PROJECT</b> Chaska - Stage 3		<b>10. SIZE AND TYPE OF BIT</b> HSA-2X3/2-SPT-3X RB		
<b>2. LOCATION (Coordinate or Station)</b> See sheet # 7		<b>11. DATUM FOR ELEVATION SHOWN (FWS or MSL)</b> N60D-1989-ADJ		
<b>3. DRILLING AGENCY</b> US-CE-C		<b>12. MANUFACTURER'S DESIGNATION OF DRILL</b> CME-750		
<b>4. HOLE NO. (As shown on drawing title and file number)</b> # 8		<b>13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN</b> 13-Jar		
<b>5. NAME OF DRILLER</b> AL Scripel		<b>14. TOTAL NUMBER CORE BOXES</b> —		
<b>6. DIRECTION OF HOLE</b> <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		<b>15. ELEVATION GROUND WATER</b> 715.1'		
<b>7. THICKNESS OF OVERBURDEN</b> 60.0		<b>16. DATE HOLE</b> STARTED 6/6/92 COMPLETED 6/18/92		
<b>8. DEPTH DRILLED INTO ROCK</b> —		<b>17. ELEVATION TOP OF HOLE</b> 727.50		
<b>9. TOTAL DEPTH OF HOLE</b> 60.0		<b>18. TOTAL CORE RECOVERY FOR BORING</b> —		
		<b>19. SIGNATURE OF INSPECTOR</b> [Signature]		

ELEVATION 727.5	DEPTH 0.0	LEGEND CL	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
			Silty Clay (CL)	2X3/2		SPT = 140 lbs @ 30" Drop
			- V. Soft	P		HSA = 4" ID Hollow Stem Auger
			- L. to M. Plasticity	U		4/RB = With 3 1/2" Roller Bit
			- Calcium = 3.3%	S		
			- Gray	H		
			- 65.5%			
			- 30% C.I.			
			- 5% organic			
			- * Sugar Beet Process Residue			
	10					
	20					
	30					
	40					
	50					
	60					
	70					
	80					
	90					
	100					

LOGGING LOG		Hole No. 92-1784		SHEET 2 OF 7 SHEETS		
LOCATION (County, State or Federal)		INSTALLATION N.C.S.				
DATE		NO. SIZE AND TYPE OF BIT				
DRILLING LOG		17. DATE/TIME FOR ELEVATION KNOWN (TIME or HRS.)				
1. HOLE NO. (As shown on drawing title and site number)		18. MANUFACTURER'S DESIGNATION OF DRILL				
2. NAME OF DRILLER		19. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED	UNDISTURBED	
3. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT.		14. TOTAL NUMBER CORE BOXES				
4. THICKNESS OF OVERBURDEN		15. ELEVATION GROUND WATER				
5. DEPTH DRILLED INTO ROCK		16. DATE MOLE STARTED COMPLETED				
6. TOTAL DEPTH OF HOLE		17. ELEVATION TOP OF HOLE				
		18. TOTAL CORE RECOVERY FOR BORING				
		19. SIGNATURE OF INSPECTOR				
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	S CORE RECOVERED	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
717.5	10.0					
		CL	Fine silty clay (CL) - V. Soft - L. to M. Plasticity - Saturated - Gray - Root Layers - Shale - Bent from surface	2x2 1/2	P	- HSA set to 10.0' - Sampled to 15.0' W. Bell Time
	11.0				U	149 149 8:05 2:15 8:15 9:05
	12.0				S	
715.1	12.4	W.L.		H	SN3	
				P 3.0 A 2.7 T 13.0	13.0 / 15.0	
	13.0			SPT	2x	
	14.0				of	
	15.0			Took		
	16.0			P 3.0 A 2.5 T 18.0	2x2 1/2	- Set HSA to 15.0'
	17.0			P		
	18.0			U		
	19.0			S	SN4	
	20.0			11	18.0 / 19.4	
	21.0			P 3.0 A 3.2 T 18.0		
	22.0			SPT	O	
	23.0				O	
	24.0			I		- Set HSA to
707.6	24.4			P 3.0 A 3.2 T 18.0		
			see Next + sheet 60			

LOGGING LOG		DIVISION		METALLOG		SHEET	
PROJECT		LOCATION		DATE		PAGE	
Alaska - Stage 3		St. Paul District		1974		1 of 7 SHEETS	
1. HOLE NO. (As shown on drawing title and log number)				2. SIZE AND TYPE OF BIT			
3. NAME OF DRILLER				11. DAYUM FOR ELEVATION SHOWS (750 = 100)			
4. DIRECTION OF HOLE				12. MANUFACTURER'S DESIGNATION OF DRILL			
5. THICKNESS OF OVERBURDEN				13. TOTAL NO. OF OVER- BURDEN SAMPLES TAKEN			
6. DEPTH DRILLED INTO ROCK				14. TOTAL NUMBER CORE BOXES			
7. TOTAL DEPTH OF HOLE				15. ELEVATION GROUND WATER			
8. DATE HOLE				16. DATE HOLE			
9. ELEVATION TOP OF HOLE				17. ELEVATION TOP OF HOLE			
10. TOTAL CORE RECOVERY FOR BORING				18. SIGNATURE OF INSPECTOR			
ELEVATION		DEPTH		CLASSIFICATION OF MATERIALS (Description)		REMARKS	
707.5		200		Silty organic clay (CL)		2x2 1/2	
706.5		21.0		- Soft		P	
				- L Plasticity		SN5	
				- Moist		20.0	
				- Black		21.0	
				- Plant Matter & Shells		H	
				80% clay		S	
				15% organics		H	
				5% silt		D 3.0	
				Sand like organic clay (CL)		R 3.0	
				- Soft		T 230	
				- L Plasticity		SPT	
				- Spongy		1	
				- Wet saturated		2	
				- Black & Brown		2	
				- Shells & Plant Matter		3	
				Strong Rr w/ acid		P 2.0	
				70% clay		T 250	
				20% Sand (lagoon)		2x2 1/2	
				10% organics		P	
				Replacement Material		H	
						S	
						H	
						SPT	
						1	
						0	
						1	
						L	
						P	
						T	
						250	
697.5		200					





**ASKA - STAGES**

UES

OF 7 SHEETS

10. SIZE AND TYPE OF BIT		
11. DATE FOR ELEVATION SHOWN (YEAR or YEAR)		
12. MANUFACTURER'S DESIGNATION OF DRILL		
13. TOTAL NO. OF OVER- BURDEN SAMPLES TAKEN	RETURNED	UNRETURNED
14. TOTAL NUMBER CORE BOXES		
15. ELEVATION GROUND WATER		
16. DATE HOLE	STARTED	COMPLETED
17. ELEVATION TOP OF HOLE		
18. TOTAL CORE RECOVERY FOR BORING		
19. SIGNATURE OF INSPECTOR		

2. DIRECTION OF HOLE  
☐ VERTICAL ☐ INCLINED \_\_\_\_\_ DEG. FROM VERT.

## 7. THICKNESS OF OVERBURDEN

**3. DEPTH DRILLED INTO ROCK**

**2. TOTAL DEPTH OF HOLE**

17. ELEVATION TOP OF HOLE

**18. TOTAL CORE RECOVERY FOR BORING**

19. SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	S CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
867.5	40.0	.		.	.	
		OL	Sand like Organic Clay (OL) <u>Cont</u> - Soft - L. Plasticity - Saturated - Brown w/ some Black - Shells plant Mater - CaCO <sub>3</sub> 50% Clay 43% Sand (CaCO <sub>3</sub> ) 7% Organics	2x2 1/2 P H H		
	41.0					
	42.0					
	43.0		Silty Clay seam (CH) - Soft - M Stiff - H. Plasticity - Moist wet - Gray & Black - Shell Fragments & plant matter	P 3.0 T 43.0 SPT 0		
84.0	43.5					
	44.0	CH		2	SNIC	
	44.4		40% Clay 7% silt 3% organics Trace sand (F) (OL) same as above	2	43.5	
83.1	44.4				44.4	
	45.0	OL		3 2.0 1.5 2x2 1/2		- Clean Hole to 45.0' by RB
	45.7			10		
1.8	46.0	GP-GM	Silly Sandy Gravel (GP-GM) - V. Dense - Saturated - Brown w/ Fe stain 90% Gravel (L.S.) coarse 10% Sand (M to C) 10% Silt	53 97 3.0 2.0 1.3 4.0		- 2x2 1/2 Rock Block - SPT - Partial Rock Block
	42.0					
	42.0		Contact From Blow Count Silly Sand (SP-SM) - M Dense - Saturated - Orange - Fe stain 95% Sand F+OC 5% Silt Trace (F) gravel	SPT 40 25 35 1.5 2.0 1.3	SNII 48.0 50.0	- clean Hole to 50.0' V. Ruff Drill action - Add 20 lb Bentonite
	44.0					
	44.4	SA-SM				
82.5						

NOV 1964 12 36 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT	CHARTER - STAFF	INDEX NO.	12345
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B-69

LOG		DIVISION		INSTALLATION		SHEET	
SKA - Stage 3		NCDP		NLS		OF 7 SHEETS	
LOCATION (Coordinates or Section)				10. SIZE AND TYPE OF BIT			
DRILLING AGENCY				11. DAYTON FOR ELEVATION SHOWN (FEET - INCHES)			
12. MANUFACTURER'S DESIGNATION OF DRILL				13. TOTAL NO. OF OVER- BURDEN SAMPLES TAKEN			
14. TOTAL NUMBER CORE BOXES				15. ELEVATION GROUND WATER			
16. DATE HOLE				STARTED		COMPLETED	
17. ELEVATION TOP OF HOLE				18. TOTAL CORE RECOVERY FOR BORING			
19. SIGNATURE OF INSPECTOR				20. SIGNATURE OF DRILLER			

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	5 CORE RECON- STRY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
677.5	50.0		Silty Sand (SP-SM) Cont.	27 1/2		
			- M. Dense	29		
			- Saturated			
			- Tan Brown			
			- Fe Stain			
			95% Sand (M+OC)	26		
			5% Silt			
			Trace (F, Gravel)	27		
				D3.0 R 2.0 T 530 SPT	SN 12 53.0	
			4' Silty Clay Seam (CL)	5	55.0	
			- Stiff	8		
			- M. to H. Plasticity			
			- Moist	10		
			- Gray			
			- Laminated			
			90% Clay	16 D3.0 R 1.6 T 550 27 1/2		
			30% Silt	25		
672.0	55.5					- Clean Hole to 55.0' GYRB
671.6	55.9	CH				- Ruff Drilling
			Sand (SP)			- END of shift - 6/8/92
			- M. Dense	35		
			- Saturated			
			- Green tan			
			96% Sand (M+OC)	50		
			4% Silt	D3.0 R 2.2 T 58.0 SPT	SN 13 59.0 60.0	
				7		
				13		
				16		
				D D3.0 R 1.6 T 60.0		
667.5	60.0					- Tremie Grout - Pull Casing - Top off Hole w/ Grout

LOCATION (Coordinates or Position)

TRILLING AGENCY: 3-17

HOLE NO. (As shown on drawing title and g/p marked)

8. NAME OF DRILLER

4. DIRECTION OF HOLE

7. THICKNESS OF OVERBURDEN

8. DEPTH DRILLED INTO ROCK.

D. TOTAL DEPTH OF HOLE			

**NO. SIZE AND TYPE OF INJURY**

11. DAYTON FOR I. DAYTON, BROWN, 7-2-44

1956

4. MANUFACTURER'S DESIGNATION OF ORIEL

12. TOTAL NO. OF DYER BURDEN SAMPLES TAKEN	DISCOVERED	UNDISCOVERED
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14. TOTAL NUMBER CORE BOXES. 1964

12. ELEVATION GROUND WATER	
13. DATE MOLE	STARTED COMPLETED

17. ELEVATION TOP OF HOLE			
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18. TOTAL CORE RECOVERY FOR BORING \_\_\_\_\_  
19. SIGNATURE OF INSPECTOR \_\_\_\_\_

Signature of Inspector *[Signature]*

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	SCORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
<p>The diagram is a hand-drawn site map overlaid on a grid. At the top, a horizontal line is labeled 'Stoughton Ave'. On the left, a vertical line is labeled 'Sugar Plant Fence'. A large, irregular, light-shaded area represents a field or property. Within this area, a vertical line is labeled 'Gravel Road'. To the left of the gravel road, a rectangular area is labeled 'Gas Line Substation'. Above the gravel road, two points are marked with dots and labeled 'P.P.' (Probably Point). Below the gravel road, a point is marked with a dot and labeled 'P.P. w/ Motor'. A vertical line segment is labeled 'N 28° W' and '744'. A horizontal line segment at the bottom is labeled '75.0'' and '42-173 ft'. A north arrow is drawn on the right side of the map, pointing towards the upper right.</p>						



LOG		DIVISION	INSTALLATION	DATE	NO. OF SHEETS
Ka - Stage 3		NCD	NCS	92-174M	2
LOCATION (Coordinate or Station)		10. SIZE AND TYPE OF BIT			
11. DAYTIME FOR ELEVATION SHOWN (TIME or DATE)		12. MANUFACTURER'S DESIGNATION OF DRILL			
13. TOTAL NO. OF OVER-DRIVEN SAMPLES TAKEN		14. TOTAL NUMBER CORE BOXES			
15. ELEVATION GROUND WATER		16. DATE HOLE			
17. ELEVATION TOP OF HOLE		18. TOTAL CORE RECOVERY FOR BORING			
19. SIGNATURE OF INSPECTOR		20. REMARKS			
21. SIGNATURE OF DRILLER		22. SIGNATURE OF SUPERVISOR			
23. SIGNATURE OF AGENT		24. SIGNATURE OF OWNER			
25. SIGNATURE OF CONTRACTOR		26. SIGNATURE OF INSPECTOR			
27. SIGNATURE OF AGENT		28. SIGNATURE OF OWNER			
29. SIGNATURE OF CONTRACTOR		30. SIGNATURE OF INSPECTOR			
31. SIGNATURE OF AGENT		32. SIGNATURE OF OWNER			
33. SIGNATURE OF CONTRACTOR		34. SIGNATURE OF INSPECTOR			
35. SIGNATURE OF AGENT		36. SIGNATURE OF OWNER			
37. SIGNATURE OF CONTRACTOR		38. SIGNATURE OF INSPECTOR			
39. SIGNATURE OF AGENT		40. SIGNATURE OF OWNER			
41. SIGNATURE OF CONTRACTOR		42. SIGNATURE OF INSPECTOR			
43. SIGNATURE OF AGENT		44. SIGNATURE OF OWNER			
45. SIGNATURE OF CONTRACTOR		46. SIGNATURE OF INSPECTOR			
47. SIGNATURE OF AGENT		48. SIGNATURE OF OWNER			
49. SIGNATURE OF CONTRACTOR		50. SIGNATURE OF INSPECTOR			
51. SIGNATURE OF AGENT		52. SIGNATURE OF OWNER			
53. SIGNATURE OF CONTRACTOR		54. SIGNATURE OF INSPECTOR			
55. SIGNATURE OF AGENT		56. SIGNATURE OF OWNER			
57. SIGNATURE OF CONTRACTOR		58. SIGNATURE OF INSPECTOR			
59. SIGNATURE OF AGENT		60. SIGNATURE OF OWNER			
61. SIGNATURE OF CONTRACTOR		62. SIGNATURE OF INSPECTOR			
63. SIGNATURE OF AGENT		64. SIGNATURE OF OWNER			
65. SIGNATURE OF CONTRACTOR		66. SIGNATURE OF INSPECTOR			
67. SIGNATURE OF AGENT		68. SIGNATURE OF OWNER			
69. SIGNATURE OF CONTRACTOR		70. SIGNATURE OF INSPECTOR			
71. SIGNATURE OF AGENT		72. SIGNATURE OF OWNER			
73. SIGNATURE OF CONTRACTOR		74. SIGNATURE OF INSPECTOR			
75. SIGNATURE OF AGENT		76. SIGNATURE OF OWNER			
77. SIGNATURE OF CONTRACTOR		78. SIGNATURE OF INSPECTOR			
79. SIGNATURE OF AGENT		80. SIGNATURE OF OWNER			
81. SIGNATURE OF CONTRACTOR		82. SIGNATURE OF INSPECTOR			
83. SIGNATURE OF AGENT		84. SIGNATURE OF OWNER			
85. SIGNATURE OF CONTRACTOR		86. SIGNATURE OF INSPECTOR			
87. SIGNATURE OF AGENT		88. SIGNATURE OF OWNER			
89. SIGNATURE OF CONTRACTOR		90. SIGNATURE OF INSPECTOR			
91. SIGNATURE OF AGENT		92. SIGNATURE OF OWNER			
93. SIGNATURE OF CONTRACTOR		94. SIGNATURE OF INSPECTOR			
95. SIGNATURE OF AGENT		96. SIGNATURE OF OWNER			
97. SIGNATURE OF CONTRACTOR		98. SIGNATURE OF INSPECTOR			
99. SIGNATURE OF AGENT		100. SIGNATURE OF OWNER			

LOG		DIVISION	INSTALLATION	Hole No. 92-174M	
NCD		NCD	NCD	SHEET 3 OF 6	
Project - Stage 3			10. SIZE AND TYPE OF BIT		
11. MANUFACTURER'S DESIGNATION OF DRILL			12. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN		
13. ELEVATION GROUND WATER			14. TOTAL NUMBER CORE BOXES		
15. ELEVATION TOP OF HOLE			16. TOTAL CORE RECOVERY FOR BORING		
17. SIGNATURE OF INSPECTOR			18. SIGNATURE OF INSPECTOR		
19. SIGNATURE OF INSPECTOR			20. SIGNATURE OF INSPECTOR		
21. SIGNATURE OF INSPECTOR			22. SIGNATURE OF INSPECTOR		
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65. SIGNATURE OF INSPECTOR			66. SIGNATURE OF INSPECTOR		
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95. SIGNATURE OF INSPECTOR			96. SIGNATURE OF INSPECTOR		
97. SIGNATURE OF INSPECTOR			98. SIGNATURE OF INSPECTOR		
99. SIGNATURE OF INSPECTOR			100. SIGNATURE OF INSPECTOR		

659.2 20.0

FORM 12-36 PREVIOUS EDITIONS ARE OBSOLETE

Chad Kam Stage 3 92-174M

B-74

PROJECT <b>Chaska - Stage 3</b>		INSTALLATION <b>NCS</b>		SHEET <b>OF 6 SHEETS</b>	
10. SIZE AND TYPE OF BIT		11. DAY OF ELEVATION BROWN (YR - 2 - 20)			
12. MANUFACTURER'S DESIGNATION OF DRILL		13. TOTAL NO. OF OVER- BURDEN SAMPLES TAKEN			
14. TOTAL NUMBER CORE BOXES		15. ELEVATION GROUND WATER			
16. DATE HOLE		STARTED		COMPLETED	
17. ELEVATION TOP OF HOLE		18. TOTAL CORE RECOVERY FOR BORING			
19. SIGNATURE OF INSPECTOR		20. SIGNATURE OF INSPECTOR			
21. SIGNATURE OF INSPECTOR		22. SIGNATURE OF INSPECTOR			

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
689.2	38.0					
		SP	Sand (SP) - M. Dense - Saturated - Tan Brown 96% Sand 4% Silt Trace F. Gravel * Gravel Zone 5.0' to 3.0' 10% Gravel	2x2 1/2		
	31.0			18		
	32.0			24		
	33.0			24		
	34.0			4		
	35.0			4		
	36.0			10		
	37.0			21		
	38.0			32		
	39.0			4		
	40.0			7		
	41.0			11		
	42.0			13		
	43.0			14		
	44.0			15		
	45.0			16		
	46.0			17		
	47.0			18		
	48.0			19		
	49.0			20		
	50.0			21		
	51.0			22		
	52.0			23		
	53.0			24		
	54.0			25		
	55.0			26		
	56.0			27		
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	58.0			29		
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	108.0			79		
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	111.0			82		
	112.0			83		
	113.0			84		
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	120.0			91		
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	122.0			93		
	123.0			94		
	124.0			95		
	125.0			96		
	126.0			97		
	127.0			98		
	128.0			99		
	129.0			100		
	130.0			101		
	131.0			102		
	132.0			103		
	133.0			104		
	134.0			105		
	135.0			106		
	136.0			107		
	137.0			108		
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	139.0			110		
	140.0			111		
	141.0			112		
	142.0			113		
	143.0			114		
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	145.0			116		
	146.0			117		
	147.0			118		
	148.0			119		
	149.0			120		
	150.0			121		
	151.0			122		
	152.0			123		
	153.0			124		
	154.0			125		
	155.0			126		
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	158.0			129		
	159.0			130		
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	161.0			132		
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	169.0			140		
	170.0			141		
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	172.0			143		
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	178.0			149		
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	253.0			224		
	254.0			225		
	255.0			226		
	256.0			227		
	257.0			228</		

Date: 9-2-73

Project: **DURD**      Area: **West District**

1. HOLE NO. **SK-2 Stages**

2. DATE OF ELEVATION **9-2-73**

3. NAME OF DRILLER

4. DIRECTION OF HOLE  
☐ VERTICAL ☐ INCLINED \_\_\_\_\_ DEG. FROM VERT.

5. THICKNESS OF OVERBURDEN

6. DEPTH DRILLED INTO ROCK

7. TOTAL DEPTH OF HOLE

8. SIZE AND TYPE OF BIT

9. TOTAL NO. OF OVER-RODDED SAMPLES TAKEN

10. TOTAL NUMBER CORE BOXES

11. ELEVATION GROUND WATER

12. DATE HOLE STARTED COMPLETED

13. ELEVATION TOP OF HOLE

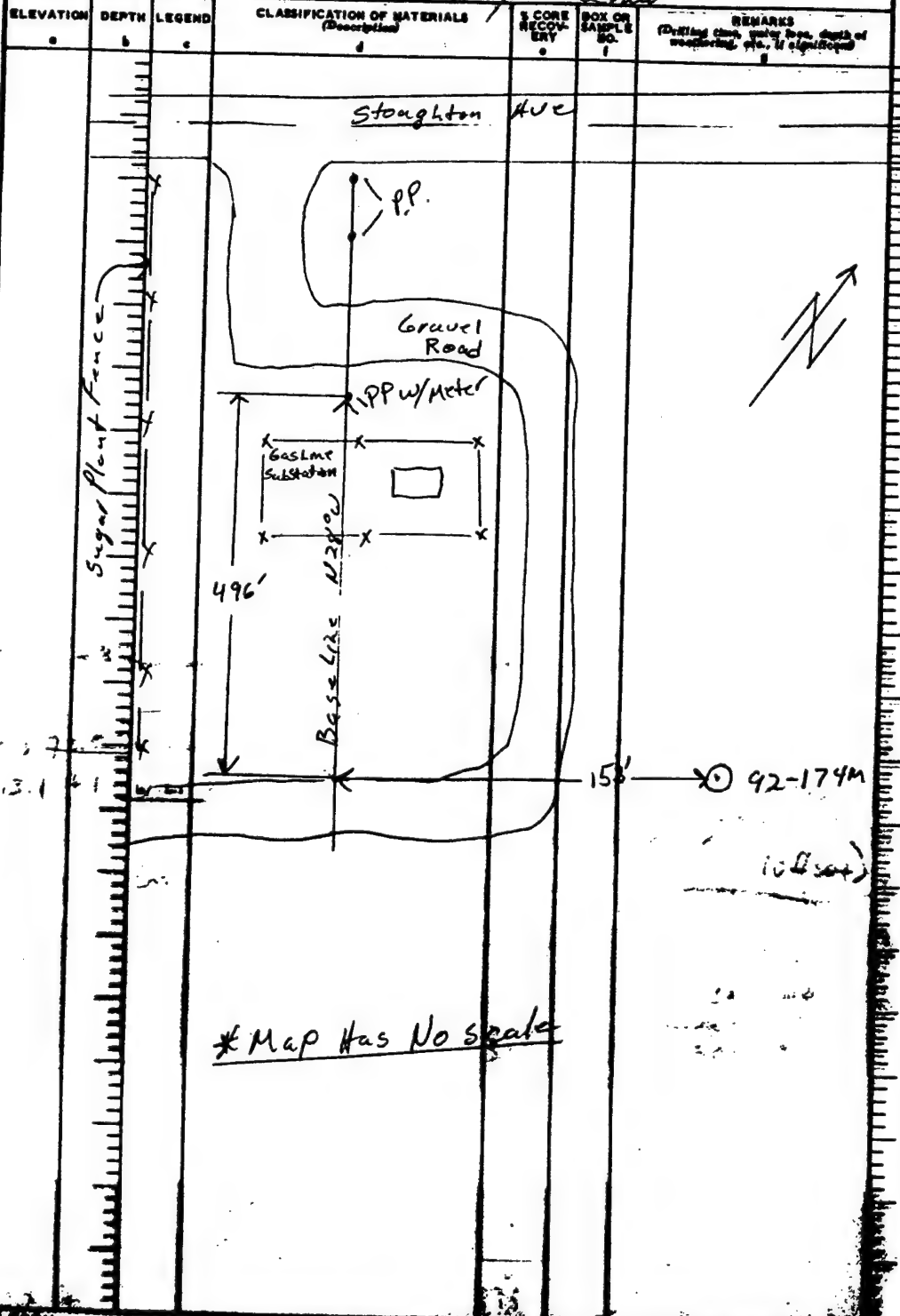
14. TOTAL CORE RECOVERY FOR BORING

15. SIGNATURE OF INSPECTOR

ELEVATION 679.2	DEPTH 40.0	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
			Sand (SP)	20 1/2		
			- M. Dense	11		
			- Saturated			
			- Tan Brown	18		
			% Sand (F+OC)			
			% Silt			
			Trace F. Gravel			
	41.0			18		
	42.0			18		
	43.0			D3.0 R 2.1 T 53.0		
				SPT 5		
				7		
675.2	44.0	SP	1/4" Seam Fe Stain under Clay	9		
	45.0			14 D 2.0 R 1.8 T 45.0		
				20 1/2		
				22		
	46.0			45		- Clean Hole to 45.0' w/RB
						- Mix Drilling Fluid
						- 35 gal slurry 100 lbs cement
						- Tremie grout
						- Pull casing
						- Add Grout to Hole To Surface
	47.0			57		
	48.0			D3.0 R 2.3 T 48.0		
				SPT 7		
	49.0			15		
				12		
669.2	50.0		END of Boring	15 D 2.0 R 2.0 T 50.0		



LOG		District	
Alaska - St. George 3		St. George District	
HOLE NO. (As shown on preceding map)		DATE	
NAME OF DRILLER		DATE HOLE STARTED	
DIRECTION OF HOLE		DATE HOLE COMPLETED	
THICKNESS OF OVERBURDEN		ELEVATION TOP OF HOLE	
DEPTH DRILLED INTO ROCK		TOTAL CORE RECOVERY FOR BORING	
TOTAL DEPTH OF HOLE		SIGNATURE OF INSPECTOR	



# LOG OF BORING



PROJECT: 74-139		SOIL BORINGS Effluent Polishing Plant Chaska Treatment Plant Chaska, MN	BORING: ST-1
		LOCATION: 2' East, 1' North of Stairsteps (NE corner)	
		DATE: 4-22-74	SCALE: 1"=4'

Elev.	Depth	Description of Materials	BPF	WL	Tests or Notes
712.4	0				Page 1 of 2
		Fill, Samples ranged from plastic, Sandy Loam to Sandy Clay Loam, with a trace of Gravel, with traces of organic material and fibers, dark brown and dark gray, moist to wet  (medium to rather stiff)			Surface elevation referenced to floor slab of structure, elevation = 715.4 M.C. = 12.3%
			10		
			8		M.C. = 12.0%
			<input checked="" type="checkbox"/>		T.W. #1
			10		M.C. = 16.0%
			35		*Sampler encountered piece of coarse gravel M.C. = 14.0%
699.4	13		6		M.C. = 13.9%
		Organic Sandy Loam, with vegetation, glass, tins, branches, and fibers, black, very wet (soft topsoil and debris)	<input checked="" type="checkbox"/>		T.W. #2
697.4	15		4		
		Slightly organic Silty Clay Loam to Silty Clay, with some layers of slightly organic Clay, with a trace of roots and fibers, very dark gray to black, wet (medium to rather soft alluvium)	<input checked="" type="checkbox"/>		T.W. #3
			6		M.C. = 51.6 L.L. = 53 O.C. = 8.9 P.L. = 24
			6		M.C. = 50.1%
			<input checked="" type="checkbox"/>		O.C. = 9.3%
					T.W. #4
			5		M.C. = 78.9 L.L. = 107 O.C. = 13.6 P.L. = 45
682.4	30		21/6		M.C. = 65.8%
					O.C. = 11.2%
		continued on next page			

(See Report and Standard Plates for evaluation and descriptive terminology.)

B-78

# LOG OF BORING



PROJECT: 74-139 SOIL BORINGS  
Effluent Polishing Plant  
Chaska Treatment Plant  
Chaska, MN

BORING: ST-1 (continued)

LOCATION:

DATE: 4-22-74

SCALE: 1"=4'

Elev.  
682.4

Depth  
30

Description of Materials

BPF

WL

Tests or Notes

(continued from previous page)

Page 2 of 2

Fine Sand to Fine Loamy Sand,  
gray, dark gray and light brown,  
waterbearing  
(medium dense to dense)

33

672.4

40

72

Water level down 12.5' with 40' of hollow-  
stem auger in ground. Water level down  
11' immediately after withdrawal of  
auger.  
Water level down 10.9' 1 day after  
completion of boring.

(See Report and Standard Plates for evaluation and descriptive terminology.)

B-79

# LOG OF BORING

**DMU**  
ENGINEERING TESTING

**PROJECT:** 74-139A Foundation Investigation  
Proposed Plant Expansion  
Chaska Wastewater Treatment  
Plant

**BORING:** ST-2

**LOCATION:**

See Attached Sketch.

**DATE:** 1/13/78

**SCALE:** 1"=4'

(See Report and Standard Plates for evaluation and descriptive terminology.)

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM: D2488)	BPF	WL	Tests or Notes
712.9	0					Sheet 1 of 2
708.9	4	SM	SILTY SAND, dark brown to black, moist. (Fill)			Bench Mark = Top of slab, existing Control Building. Elevation = 712.5.
706.9	6	SP	SAND, fine to medium-grained, with a trace of SILT, light brown, moist, loose. (Fill)	7		
		SM	SILTY SAND, fine to medium-grained, with a trace of organic, with a trace of brocks, gray, moist, loose to very loose. (Fill)	7		
701.9	11			4		
699.9	13	CL	SILTY CLAY, with a trace of organic, with a trace of wood, gray, moist, rather soft. (Fill)	4		
		MH	CLAYEY SILT, with a trace of organics, dark gray, moist, loose. (Fine Alluvium)	5		MC = 63.7% DD = 57.6 pcf  MC = 88.4%  MC = 36.1% DD = 34.2 pcf Qu = 1500 psf LL = 68% PL = 26% OC = 4.7%
696.9	16					
		CH	SILTY CLAY, with a trace of SAND, with a trace of fibers, with a trace of organics, dark gray to black, moist, rather soft. (Fine Alluvium)	TW		
				4		
688.9	24					
686.9	26	SC	CLAYEY SAND, with a trace of fibers, dark gray, wet, very loose (Coarse Alluvium)	4		
		SP	SAND, fine to medium-grained, brown, waterbearing, medium dense. (Coarse Alluvium)			
682.9	30					
				12		
			(continued on Sheet 2)			

B-80

# LOG OF BORING

**BRAUN**  
ENGINEERING TESTING

**PROJECT:** 74-139A Foundation Investigation  
Proposed Plant Expansion  
Chaska Wastewater Treatment  
Plant

**BORING:** ST-2 (continued)

**LOCATION:**

**DATE:** 1/13/78

**SCALE:** 1"=4'

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM: D2488)	BPF	WL	Tests or Notes
682.9	30					Sheet 2 of 2
680.9	32	SP	SAND, fine to medium-grained, brown, waterbearing, medium dense. (Coarse Alluvium)			
		SP	SAND, fine to medium-grained, with a trace of fine to medium Gravel, brown, waterbearing, medium dense to dense. (Coarse Alluvium)	23		
672.4	40.5			30		
			Water level down 25' with 40' of hollow-stem auger in ground.  Water level down 23' immediately after withdrawal of auger.  Boring immediately backfilled.			

(See Report and Standard Plates for evaluation and descriptive terminology.)

B-81

# LOG OF BORING

**DMU**  
ENGINEERING TESTING

PROJECT: 85-082 FOUNDATION INVESTIGATION Chaska Wastewater Treatment Plant Chaska, MN					BORING: ST-6	
					LOCATION: Headworks Building See Attached Sketch.	
					DATE: 3/22/85	SCALE: 1"=4'
Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
715.7	0					Page 1 of 2
713.7	2	SM	FILL: SILTY SAND, fine to medium-grained, dark brown, very moist.			Surface elevation of borings were referred to the floor slab of the Control Building. An elevation of 712.5 was indicated for the floor elevation.
711.7	4	SC	FILL: CLAYEY SAND, fine to medium-grained, dark brown.	28		
		SM	FILL: SILTY SAND, fine-grained, dark brown, moist.	12		
708.7	7					
		SM	FILL: SILTY SAND, fine-grained, with glass and wood and other debris, brown, moist.	7		
				5		
703.7	12					
		SM & SC	FILL: SILTY SAND and CLAYEY SAND, fine-grained, with glass and wood debris, black, wet.	4		
698.7	17			11		
		CH	SILTY CLAY, non to slightly organic, with a trace of roots and shells at 20 feet, gray to black, wet, rather soft to medium (Fine Alluvium)	5		
						MC = 35% LL = 48% PL = 21% PI = 27%
						TW#3
						Approximate grade of Headworks Building.
						LL=140% PL=57% PI=83% MC=91%
686.7	29					
685.7	30	SP	SAND, fine to medium-grained,*	7		*brown, waterbearing, loose. (Coarse Alluvium)

(continued on page 2)

B-82

(See Report and Standard Plates for evaluation and descriptive terminology.)

# LOG OF BORING

**BRAUN**  
ENGINEERING TESTING

PROJECT: 85-082 FOUNDATION INVESTIGATION  
Chaska Wastewater  
Treatment Plant  
Chaska, MN

BORING: ST-6 (continued)

LOCATION:

Headworks Building  
See Attached Sketch

DATE: 3/22/85

SCALE: 1"=4'

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
685.7	30	SP	SAND, fine to medium-grained, brown, waterbearing, loose. (Coarse Alluvium)			Page 2 of 2
680.2	35.5		Water level down 29' with 35' of hollow-stem auger in the ground.  Water level down 11' immediately after withdrawal of auger.  Water level down 11' when rechecked 1/2 hour later.	8		

(See Report and Standard Plates for evaluation and descriptive terminology.)

B-83

# LOG OF BORING

**ENGINEERING TESTING**

**PROJECT:** 85-082 FOUNDATION INVESTIGATION  
Chaska Wastewater  
Treatment Plant  
Chaska, MN

**BORING:** ST-8

**LOCATION:**

CL2 Contact Tank  
See Attached Sketch.

**DATE:** 3/22/85

**SCALE:** 1"=4'

(See Report and Standard Plates for evaluation and descriptive terminology.)

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
713.7	0					Page 1 of 2
711.7	2	SM	FILL: SILTY SAND, fine-grained, black.			
709.7	4	SM	FILL: SILTY SAND, fine to medium-grained, dark brown, moist.	18		
		SM-SC & SM	FILL: SILTY CLAYEY SAND and SILTY SAND, fine to medium-grained, with some wood, dark brown to brown.	53		
704.7	9			25		
701.7	12	SP-SM	FILL: SLIGHTLY SILTY SAND. with some CLAYEY SAND, fine to medium-grained, brown, moist co wet.	34		
699.7	14	CL	FILL: SILTY CLAY, with wood and a trace of PEAT, black, wet.			
		CL	SILTY CLAY and a layer of SILTY SAND, fine-grained, gray, wet. (Probable Fill)	10		
694.7	19					Approximate grade of Contact Tank.
		CH	SILTY CLAY, non to slightly organic, dark gray with layers of black, wet, medium to rather soft. (Fine Alluvium)	6		
686.7	27			4		MC=44% LL=83% PL=34% PI=49%
683.7	30	SM/ SP-SM	SILTY SAND TO SLIGHTLY SILTY SAND, fine to medium-grained, gray, waterbearing, medium dense. (Coarse Alluvium)	14		
			(continued on Page 2)			B-84



# LOG OF BORING

**ENGINEERING TESTING**

**PROJECT:** 85-082 FOUNDATION INVESTIGATION  
Chaska Wastewater  
Treatment Plant  
Chaska, MN

**BORING:** ST-8 (continued)

**LOCATION:**  
CL2 Contact Tank  
See Attached Sketch

**DATE:** 3/22/85

**SCALE:** 1"=4'

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
683.7	30					Page 2 of 2
678.2	35.5	SM/ SP-SM	SILTY SAND to SLIGHTLY SILTY SAND, fine to medium-grained, gray, waterbearing, medium dense. (Coarse Alluvium)		12	
			Water level down 31' with 35' of hollow-stem auger in ground.  Water level not encountered to cave-in depth of 11' immediately after withdrawal of auger.  Water level down 10½' 5 hours later.			

B-85

(See Report and Standard Plates for evaluation and descriptive terminology.)

# LOG OF BORING



**PROJECT:** 85-082A FOUNDATION INVESTIGATION  
Proposed Chaska Treatment Plant  
Expansion  
Chaska, MN

**BORING:** ST-10  
**LOCATION:** Proposed Headworks  
Building-  
See location sketch.

**DATE:** 9/18/85

**SCALE:** 1" = 4'

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
715.4	0	SM	FILL: SILTY SAND, fine to medium-grained, with roots, wood, glass, cobbles, and boulders, dark brown, moist.			Sheet 1 of 2
697.4	18	CL-ML	SILTY CLAY, with a trace of roots, grayish black, wet, rather soft. (Fine Alluvium)	5		
690.9	24.5	CH	FAT CLAY, dark gray to black, wet, rather stiff. (Fine Alluvium)	9		TW #1 MC=29% Organic Content = 7.6%
686.4	29	SP	SAND, fine to medium-grained, with some POORLY GRADED GRAVEL, gray, moist.	10		MC=59% TW #2 LL=106% QU=1134 FL=38% psi PI=68 *waterbearing, loose to medium dense. (Coarse Alluvium)
685.4	30					

B-86

(See Report and Standard Plates for evaluation and descriptive terminology.)

(Continued on Sheet 2)

# LOG OF BORING

**BRAUN**  
ENGINEERING TESTING

PROJECT: 85-082A FOUNDATION INVESTIGATION  
Proposed Chaska Treatment Plant  
Expansion  
Chaska, MN

BORING: ST-10 (Continued)

LOCATION:

DATE:

SCALE:

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
685.4	30	SP	SAND, fine to medium-grained, with some POORLY GRADED GRAVEL, gray, waterbearing, loose to medium dense. (Coarse Alluvium)			Sheet 2 of 2
				14		
674.9	40.5			10		
			END OF BORING.  Water level down 25' with 40' of hollow-stem auger in the ground.  Water level down 16' immediately after withdrawal of auger.  Water level down 12' 3 hours after completion of boring.  Water level down 11' 1 day after completion of boring.  Water level down 11' 2 days after completion of boring.  Boring then backfilled.			

(See Report and Standard Plates for evaluation and descriptive terminology.)

B-87

# LOG OF BORING



PROJECT: 85-082A FOUNDATION INVESTIGATION  
Proposed Chaska Treatment Plant  
Expansion  
Chaska, MN

BORING: ST-II  
LOCATION: 52' South of Proposed  
Screw Pump-  
See location sketch.

DATE: 9/19-20/85 SCALE: 1" = 4'

(See Report and Standard Plates for evaluation and descriptive terminology.)

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
725.9	0					Sheet 1 of 3
		SM	FILL: SILTY SAND, fine-grained, with some POORLY GRADED GRAVEL, with a trace of wood, brown and gray, moist, medium dense.			
				18		
				11		
711.9	14					
		SM	FILL: SILTY SAND, fine to coarse grained, with a trace of roots, gray, moist, medium dense.	18		
			layer of wood at 18'. Cobbles and Boulders at 19'.			
706.9	19					
		MH	FILL: ELASTIC SILT, with a trace of roots and fibers, some cinders brown to gray, moist to wet, rather soft.	5		
703.9	22					
		SP	SAND, fine to medium-grained, light brown, moist, medium dense. (Coarse Alluvium)			
				13		
698.9	27					
		MH	ELASTIC SILT, with lenses of SANDY SILT, gray, wet to waterbearing, medium.			
695.9	30		(Fine Alluvium)	7		

(Continued on Sheet 2)

B-88

# LOG OF BORING



PROJECT: 85-082A FOUNDATION INVESTIGATION  
Proposed Chaska Treatment Plant  
Expansion  
Chaska, MN

BORING: ST-11 (Continued)

LOCATION:

DATE:

SCALE:

(See Report and Standard Plates for evaluation and descriptive terminology.)

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
695.9	30					Sheet 2 of 3
691.9	34	MH	ELASTIC SILT, with lenses of SANDY SILT, gray, wet to waterbearing, medium. (Fine Alluvium)			
686.9	39	CL-ML	SILTY CLAY, with decayed reeds, dark gray, wet to waterbearing, rather soft. (Fine Alluvium)	5		
682.9	43	CH	FAT CLAY, with some fibers, dark gray, wet to waterbearing, medium. (Fine Alluvium)	8		
679.9	46	SM	SILTY SAND, fine-grained, with a trace of POORLY GRADED GRAVEL and cobbles, gray, waterbearing, loose. (Coarse Alluvium)	9		
666.9	59	SP	SAND, fine to medium-grained, with a trace of POORLY GRADED GRAVEL, brown to gray, waterbearing, medium dense. (Coarse Alluvium)	12		
665.9	60	SP	SAND, fine to coarse-grained, with a trace of POORLY GRADED *	18		
				28		
			(Continued on Sheet 3)			

\*GRAVEL, light brown, waterbearing, medium dense.  
(Coarse Alluvium)

B-89

# LOG OF BORING



PROJECT: 85-082A FOUNDATION INVESTIGATION  
Proposed Chaska Treatment Plant  
Expansion  
Chaska, MN

BORING: ST-II (Continued)

LOCATION:

DATE:

SCALE:

Elev.	Depth	ASTM D2487 Symbol	Description of Materials (ASTM D2488)	BPF	WL	Tests or Notes
665.9	60					Sheet 3 of 3
		SP	SAND, fine to coarse-grained, with a trace of POORLY GRADED GRAVEL, light brown, waterbearing medium dense. (Coarse Alluvium)			
659.9	66			24		
			END OF BORING.  Water level down 31' with 35' of hollow-stem auger in the ground.  Water level down 8' with 65' of hollow-stem auger in the ground.  Water level down 22' immediately after withdrawal of auger.  Water level down 25' 1 hour after completion of boring.  Boring then backfilled.  Jetting water used to clear the auger below the 49' depth.			

(See Report and Standard Plates for evaluation and descriptive terminology.)

B-90

JOB NO. 4220 89-1312 VERTICAL SCALE 1" = 4' BORING NO. 12  
PROJECT CARVER COUNTY GOVERNMENT CENTER - CHASKA, MINNESOTA

WATER LEVEL MEASUREMENTS							START <u>6-9-89</u> COMPLETE <u>6-9-89</u>
DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL	METHOD <u>3 1/2" HSA 0-24 1/2'</u> @ <u>12:00</u>
6-9	12:00	26'	24 1/2'	26'	to	24 1/2'	
6-9	12:10	26'	None	19 1/2'	to	None	
					to		
					to		
CREW CHIEF <u>M. Crotty</u>							<u>B-91</u>

# LOG OF TEST BORING

JOB NO 4220 89-1312 VERTICAL SCALE 1" = 4' BORING NO 13  
 PROJECT CARVER COUNTY GOVERNMENT CENTER - CHASKA, MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS			
					NO	TYPE	W	D	$\frac{LL}{PL}$	expl.
	SURFACE ELEVATION <u>722.4'</u>									
	FILL, MIXTURE OF SILTY SAND, CLAYEY SAND AND SAND W/A LITTLE GRAVEL, some concrete, metal, brick, glass and wood, a little lean clay, dark brown and grayish brown, water in fill below about 21'	FILL			1	HSA				
			18		2	SB				
			5		3	SB				
			4		4	SB				
			12		5	SB				10%
			3		6	SB				
			9		7	SB				50%
			7		8	SB				
			5	▼	9	SB				
					10	SB				
			6		11	SB				
23	LEAN CLAY, gray, medium (CL)	FINE ALLUVIUM								
24	FAT CLAY, black, medium (CH)									
			6		12	SB				
26	End of Boring									
	NOTE: Boring backfilled with grout from depth of 5' to surface									

## WATER LEVEL MEASUREMENTS

START 6-8-89 COMPLETE 6-8-89

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
6-8	1:20	21½'	19½'	21½'	10	21'
6-8	1:50	26'	24½'	26'	10	21½'
6-8	2:00	26'	None	19'	10	None

METHOD 3½" HSA 0-24½' @ 1:50

CREW CHIEF

M. Crotty

B-92



# LOG OF TEST BORING

JOB NO 4220 89-1312 VERTICAL SCALE 1" = 4' BORING NO 15  
 PROJECT CARVER COUNTY GOVERNMENT CENTER - CHASKA, MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL SURFACE ELEVATION <u>720.7'</u>	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS			
					NO	TYPE	W	D	LL PL	
	FILL, MIXTURE OF SILTY SAND, CLAYEY SAND AND SAND W/A LITTLE GRAVEL, a little brick and metal, dark brown, brown and black	FILL			1	HSA				
			13		2	SB				
			2		3	SB				
			3		4	SB				
9	SILTY SAND, fine grained, black, moist, loose (may be fill) (SM)	TOPSOIL OR FILL	5		5	SB				0%
12	SILTY SAND, fine grained, dark brown, moist, loose (may be fill) (SM)	COARSE ALLUVIUM*	6		6	SB				
13	CLAYEY SAND, brown, medium (SC)	MIXED ALLUVIUM			7	SB	19			
14½	SAND, a few cobbles, fine grained, light brown, moist to 22½' then waterbearing, medium dense to dense (SP)	COARSE ALLUVIUM	12		8	SB				0%
			26		9	SB				
			20		10	SB				
26	End of Boring	*OR FILL								

## WATER LEVEL MEASUREMENTS

START 6-8-89 COMPLETE 6-8-89

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL	METHOD	TIME
6-8	3:15	26'	24½'	25'	10	22½'	3½" HSA 0-24½'	@ 3:15
6-8	3:25	26'	None	17'	10	None		
					10			
					10			
CREW CHIEF <u>M. Crotty</u>							<u>B-93</u>	

# LOG OF TEST BORING

JOB NO 4220 89-1312

VERTICAL SCALE 1" = 4'

BORING NO 17

PROJECT CARVER COUNTY GOVERNMENT CENTER - CHASKA, MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS			
					NO	TYPE	W	D	LL PL	EXPL.
	SURFACE ELEVATION 722.0'									
	FILL, MIXTURE OF SILTY SAND AND SAND W/A LITTLE GRAVEL, a little brick and metal, brown and black	FILL			1	HSA				
			27		2	SB				
9	FILL, MIXTURE OF SILTY SAND, BRICK, WOOD AND CINDERS, dark grayish brown		7		3	SB				
			6		4	SB				5%
18½	CLAYEY SAND, dark brown to brown, soft (SC)	MIXED ALLUVIUM	4		5	SB				
22	SAND W/A LITTLE GRAVEL, a few cobbles, fine to medium grained, light brown, moist to 23½' then waterbearing, medium dense (SP)	COARSE ALLUVIUM	11		6	SB				
	NOTE: Boring backfilled with grout from depth of 5' to surface		12		7	SB				
31	End of Boring									

## WATER LEVEL MEASUREMENTS

START 6-12-89 COMPLETE 6-12-89

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL	METHOD	TIME
6-12	12:15	26'	24½'	25'	10	23½'	3½" HSA 0-29½'	@ 12:35
6-12	12:35	31'	29½'	29½'	10	24'		
6-12	12:45	31'	None	19'	10	None		
					10		CREW CHIEF M. Crotty B-94	

# LOG OF TEST BORING

JOB NO 4220 89-1312 VERTICAL SCALE 1" = 4' BORING NO 27  
 PROJECT CARVER COUNTY GOVERNMENT CENTER - CHASKA, MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL ↓ SURFACE ELEVATION <u>720.7'</u>	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS			
					NO	TYPE	W	D	LL PL	Expl.
	FILL, MIXTURE OF CLAYEY SAND AND SILTY SAND, some brick and gravel, a little metal and wood, black, dark brown, grayish brown and brown (See Note)	FILL			1	HSA				
			15		2	SB				
			9		3	SB				
			10		4	SB				
			10		5	SB				
			6		6	SB				0%
			9		7	SB				
			13		8	SB				
21			10		9	SB				
	End of Boring									
	NOTE: Encountered sanitary sewer line at depth of 19'. Left hollow stem auger in borehole upon request of City of Chaska Sewer Department. They removed in exavating for the repair of the sewer line.									

## WATER LEVEL MEASUREMENTS

START 6-8-89 COMPLETE 6-9-89

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL	METHOD	TIME
6-9	9:30	21'	19½'		10	NMR	3½" HSA 0-19½'	9:30
					10			
					10			
					10			
CREW CHIEF <u>M. Crotty</u>							<u>B-95</u>	

# LOG OF TEST BORING

JOB NO 4220 89-1312 VERTICAL SCALE 1" = 4' BORING NO 30  
 PROJECT CARVER COUNTY GOVERNMENT CENTER - CHASKA, MINNESOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS			
					NO	TYPE	W	D	LL PL	Qu
	↙ SURFACE ELEVATION <u>725.8'</u>									
	FILL, MIXTURE OF SILT AND SILTY SAND W/A LITTLE GRAVEL, dark brown, brown and black	FILL			1	HSA				
7			21		2	SB				
9	FILL, MIXTURE OF SILTY SAND AND ASHES, a little gravel, black and brown		8		3	SB				
9½	FILL, MOSTLY ASHES, dark grayish brown		2		4	SB				
12	FILL, MOSTLY SILTY SAND W/GRAVEL, a little glass, dark brown and brown		9		5	SB				
16			10		6	SB				
	End of Boring									
	NOTE: Boring backfilled with grout from depth of 5' to surface									

## WATER LEVEL MEASUREMENTS

START 6-13-89 COMPLETE 6-13-89

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
6-13	3:25	16'	14½'	15'	to	None
6-13	3:30	16'	None	11½'	to	None
					to	
					to	

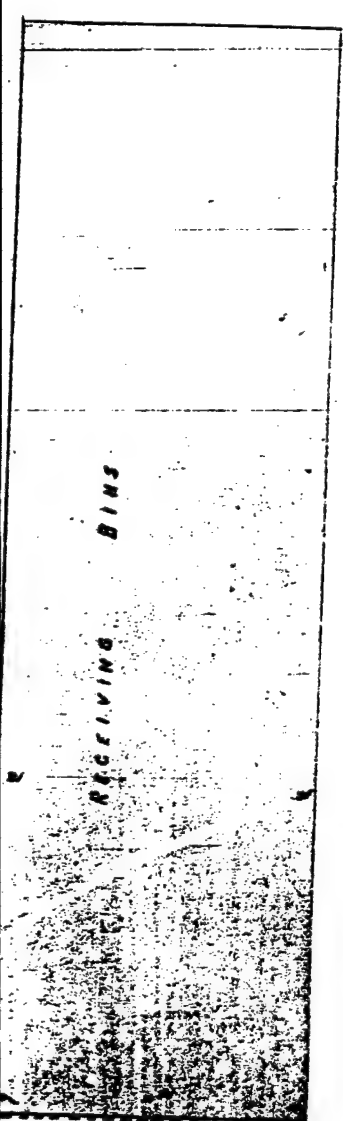
METHOD 3½" HSA 0-14½' @ 3:25

CREW CHIEF M. Crotty B-96

## APPENDIX C

11

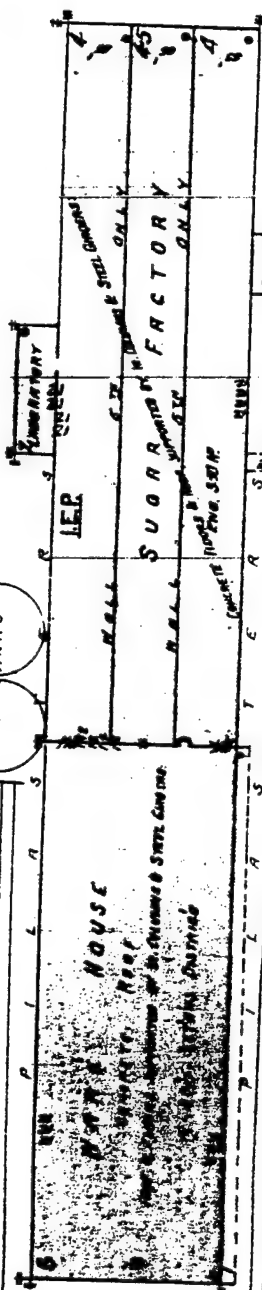
BEET  
OPERATES 60 DAY  
NATIONMAN ENTIRE  
AROUNDS - LIGHTS E.L.  
12 - 3 GALLON CHEN  
MIN. RAILING QUOTA  
DONT TAKE MORE 5 WITH



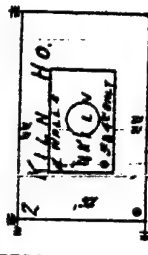
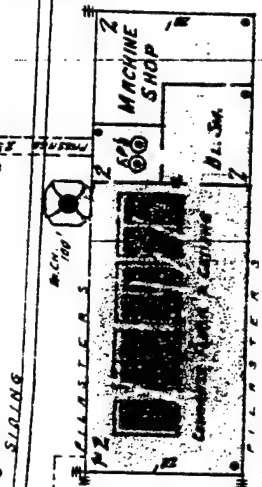
LOC

On Storage

IRON ANHS



COAL PILES



1910

Crystal Sugar  
Factory  
1910

—

1911

10<sup>2</sup>

202

203

204

205

208

102

002

157 ST.

3" N. PIPE

314  
217

219	320
217	230

~~Pine~~ Chestnut

LEVEE ST.




1911



**RANE**

80-

80'

A hand-drawn floor plan of a building, oriented vertically. The plan is divided into four rooms, numbered 5, 6, 7, and 10. Above the rooms are labels: 'SOS' above room 5, 'SAG' above room 6, 'SAG' above room 7, and 'SAG' above room 10. At the top of the plan, the word 'FILE' is written. The rooms contain various furniture items: room 5 has a bed, a desk, and a chair; room 6 has a bed, a desk, and a chair; room 7 has a bed, a desk, and a chair; room 10 has a bed, a desk, and a chair. The plan is drawn with simple lines and includes a scale bar at the bottom.

<p>6</p> 	<p>1</p>	<p>2</p> 	<p>3</p> 	<p>4</p>	<p>5</p>
<p>19</p>	<p>18</p>	<p>17</p>	<p>16</p>	<p>15</p>	

34	35	36	37	38
6	7	8	9	10
		5		

1	2	3	4	5
15	16	17	18	19

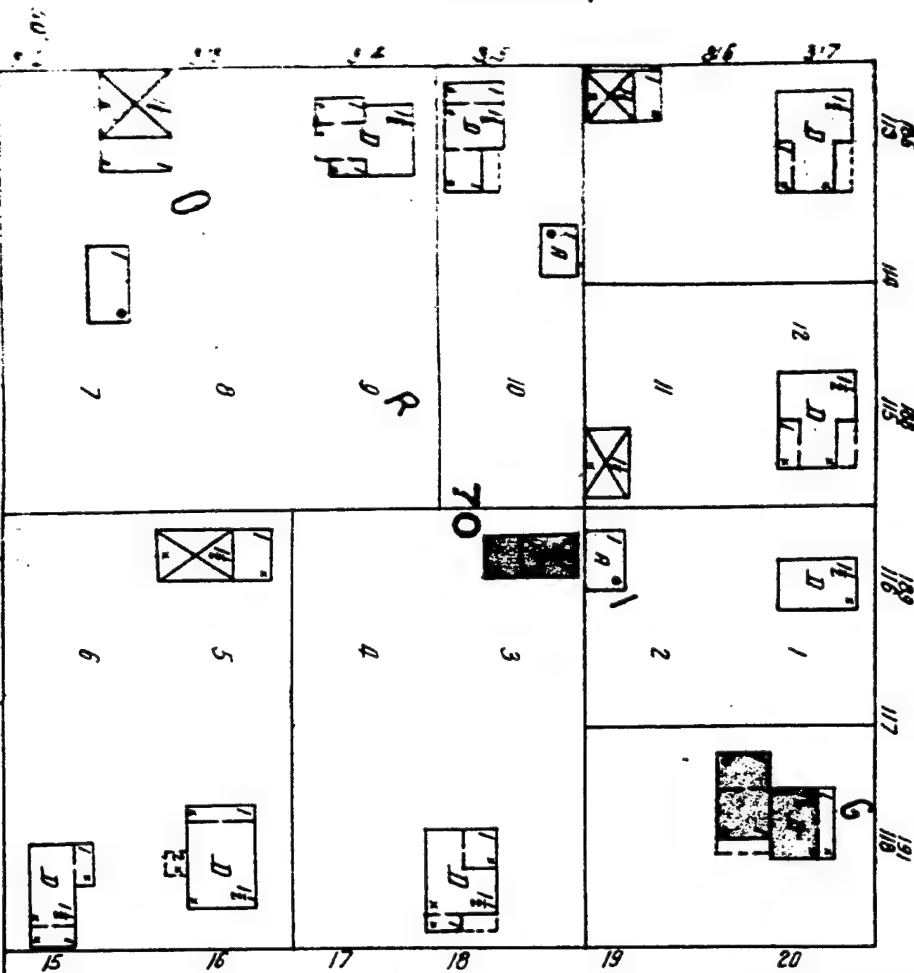
MINNESOTA

RIVER

BEYOND



Hickory



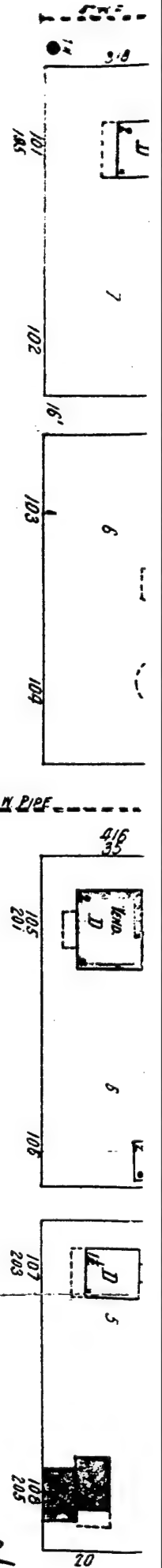
ELM

(VACATED STREET)  
FARM LAND BEYOND

1924

1 ST.  
ST.

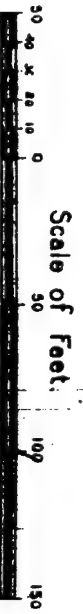
CEDAR



4/10/1924

(VACATED STREET)  
FARM LAND BEYOND

Missouri River



1924

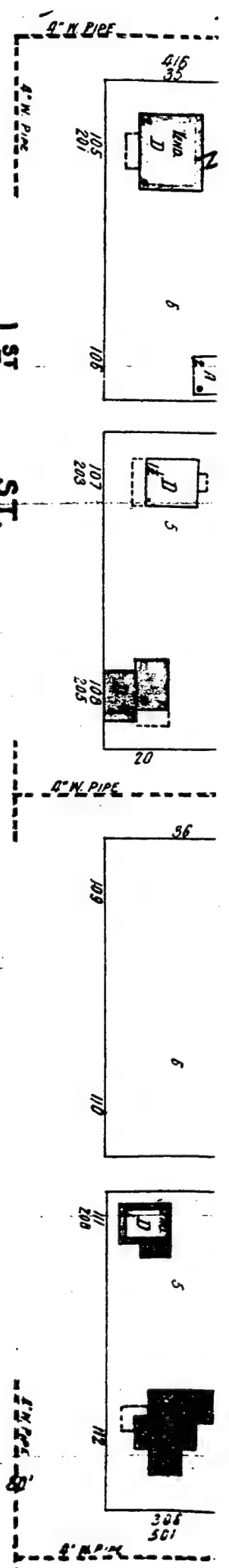
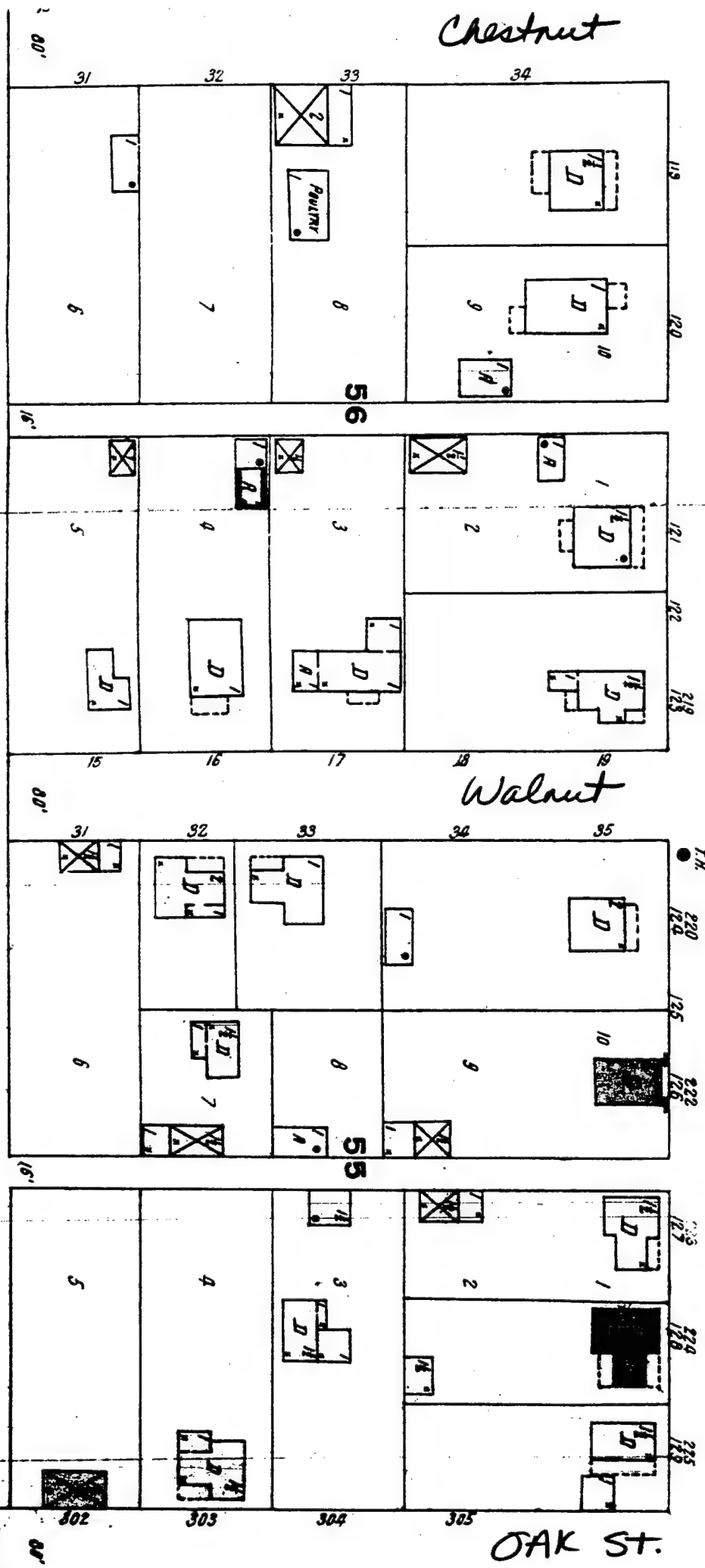
Large  
St.

Chestnut

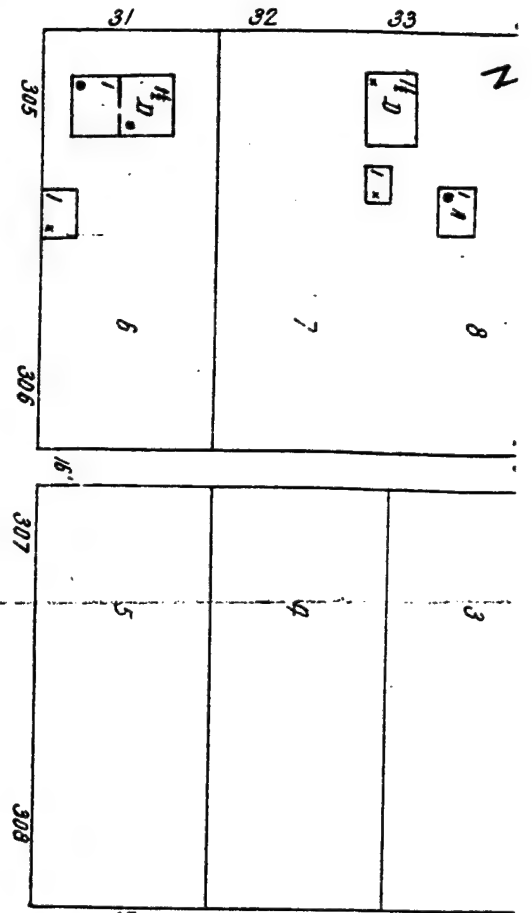
Walnut

OAK ST.

1 ST.



ASH



Maple

BEECH

1ST ST.

CONTRACTION

Scale of Feet.

Copyright 1924 by The Standard Map Co.

1924

49

Minnesota River

VACANT BEYOND

LAND

BEYOND

SCALE 100 FEET TO AN INCH

MINNESOTA SUBURBAN CO.



**are Dr. Williams' Pink Pills.** Dr. Williams' Pink Pills are the only medicine for the blood, and 35 per cent of the people are afflicted with some blood ailment. Dr. Williams' Pink Pills are the only medicine for the blood, and 35 per cent of the people are afflicted with some blood ailment. Dr. Williams' Pink Pills are the only medicine for the blood, and 35 per cent of the people are afflicted with some blood ailment.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM	BN	BO	BP	BQ	BR	BS	BT	BU	BV	BW	BX	BY	BZ	CA	CB	CC	CD	CE	CF	CG	CH	CI	CJ	CK	CL	CM	CN	CO	CP	CQ	CR	CS	CT	CU	CV	CW	CX	CY	CZ	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK	DL	DM	DN	DO	DP	DQ	DR	DS	DT	DU	DV	DW	DX	DY	DZ	EA	EB	EC	ED	EE	EF	EG	EH	EI	EJ	EK	EL	EM	EN	EO	EP	EQ	ER	ES	ET	EU	EV	EW	EX	EY	EZ	FA	FB	FC	FD	FE	FF	FG	FH	FI	FJ	FK	FL	FM	FN	FO	FP	FQ	FR	FS	FT	FU	FV	FW	FX	FY	FZ	GA	GB	GC	GD	GE	GF	GG	GH	GI	GJ	GK	GL	GM	GN	GO	GP	GQ	GR	GS	GT	GU	GV	GW	GX	GY	GZ	HA	HB	HC	HD	HE	HF	HG	HH	HI	HJ	HK	HL	HM	HN	HO	HP	HQ	HR	HS	HT	HU	HV	HW	HX	HY	HZ	IA	IB	IC	ID	IE	IF	IG	IH	II	IJ	IK	IL	IM	IN	IO	IP	IQ	IR	IS	IT	IU	IV	IW	IX	IY	IZ	JA	JB	JC	JD	JE	JF	JG	JH	JI	JJ	JK	JL	JM	JN	JO	JP	JQ	JR	JS	JT	JU	JV	JW	JX	JY	JZ	KA	KB	KC	KD	KE	KF	KG	KH	KI	KJ	KL	KM	KN	KO	KP	KQ	KR	KS	KT	KU	KV	KW	KX	KY	KZ	LA	LB	LC	LD	LE	LF	LG	LH	LI	LJ	LK	LL	LM	LN	LO	LP	LQ	LR	LS	LT	LU	LV	LW	LX	LY	LZ	MA	MB	MC	MD	ME	MF	MG	MH	MI	MJ	MK	ML	MM	MN	MO	MP	MQ	MR	MS	MT	MU	MV	MW	MX	MY	MZ	NA	NB	NC	ND	NE	NF	NG	NH	NI	NJ	NK	NL	NM	NN	NO	NP	NQ	NR	NS	NT	NU	NV	NW	NX	NY	NZ	OA	OB	OC	OD	OE	OF	OG	OH	OI	OJ	OK	OL	OM	ON	OO	OP	OQ	OR	OS	OT	OU	OV	OW	OX	OY	OZ	PA	PB	PC	PD	PE	PF	PG	PH	PI	PJ	PK	PL	PM	PN	PO	PQ	PR	PS	PT	PV	PW	PX	PY	PZ	QA	QB	QC	QD	QE	QF	QG	QH	QI	QJ	QK	QL	QM	QN	QO	QP	QQ	QR	QS	QT	QU	QV	QW	QX	QY	QZ	RA	RB	RC	RD	RE	RF	RG	RH	RI	RJ	RK	RL	RM	RN	RO	RP	RQ	RR	RS	RT	RU	RV	RW	RX	RY	RZ	SA	SB	SC	SD	SE	SF	SG	SH	SI	SJ	SK	SL	SM	SN	SO	SP	SQ	SR	SS	ST	SU	SV	SW	SX	SY	SZ	TA	TB	TC	TD	TE	TF	TG	TH	TI	TJ	TK	TL	TM	TN	TO	TP	TQ	TR	TS	TU	TV	TW	TX	TY	TZ	UA	UB	UC	UD	UE	UF	UG	UH	UI	UJ	UK	UL	UM	UN	UO	UP	UQ	UR	US	UT	UU	UV	UW	UX	UY	UZ	VA	VB	VC	VD	VE	VF	VG	VH	VI	VJ	VK	VL	VM	VN	VO	VP	VQ	VR	VS	VT	VU	VV	VW	VX	VY	VZ	WA	WB	WC	WD	WE	WF	WG	WH	WI	WJ	WK	WL	WM	WN	WO	WP	WQ	WR	WS	WT	WU	WV	WW	WX	WY	WZ	XA	XB	XC	XD	XE	XF	XG	XH	XI	XJ	XK	XL	XM	XN	XO	XP	XQ	XR	XS	XT	XU	XV	XW	XX	XY	XZ	YA	YB	YC	YD	YE	YF	YG	YH	YI	YJ	YK	YL	YM	YN	YO	YP	YQ	YR	YS	YT	YU	YV	YW	YX	YZ	ZA	ZB	ZC	ZD	ZE	ZF	ZG	Z
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**NOTE—**Standard deviation shown for each parameter.

Scale 800 feet : to an inch

Sarban  
Overview  
1924

~~AMERICAN BEET SUGAR COMPANY  
MINNESOTA SUGAR COMPANY  
BEET SUGAR FACTORY~~

[illegible]

## **APPENDIX D**



① area between  
Counthouse Lake  
+ Minnesota River

② Sugar plant holding pond / berm

Chaska

1951  
Aerial Photo

Stages 34



98184 751



Chaska

Aerial Photo  
1965

Stage 3

sugar plant  
holding pond / ber.  
O factory



Chaska Aerial Photo 1965 Stage 3

O sugar factory  
+ holding pond / berm





Sewage treatment  
plant + ○ apparent  
dump area Chaska

Aerial photo  
1965

Stage 4



aerial photo  
Chaska  
1965

area of ~~burial~~ sewage treatment  
plant  
O apparent dump site

Stage 4



Aerial  
Photo

Chaska  
1965

Stage 4

sewage treatment plant  
& associated dump site



Crystal Sugar Plant in 1970

August 1970



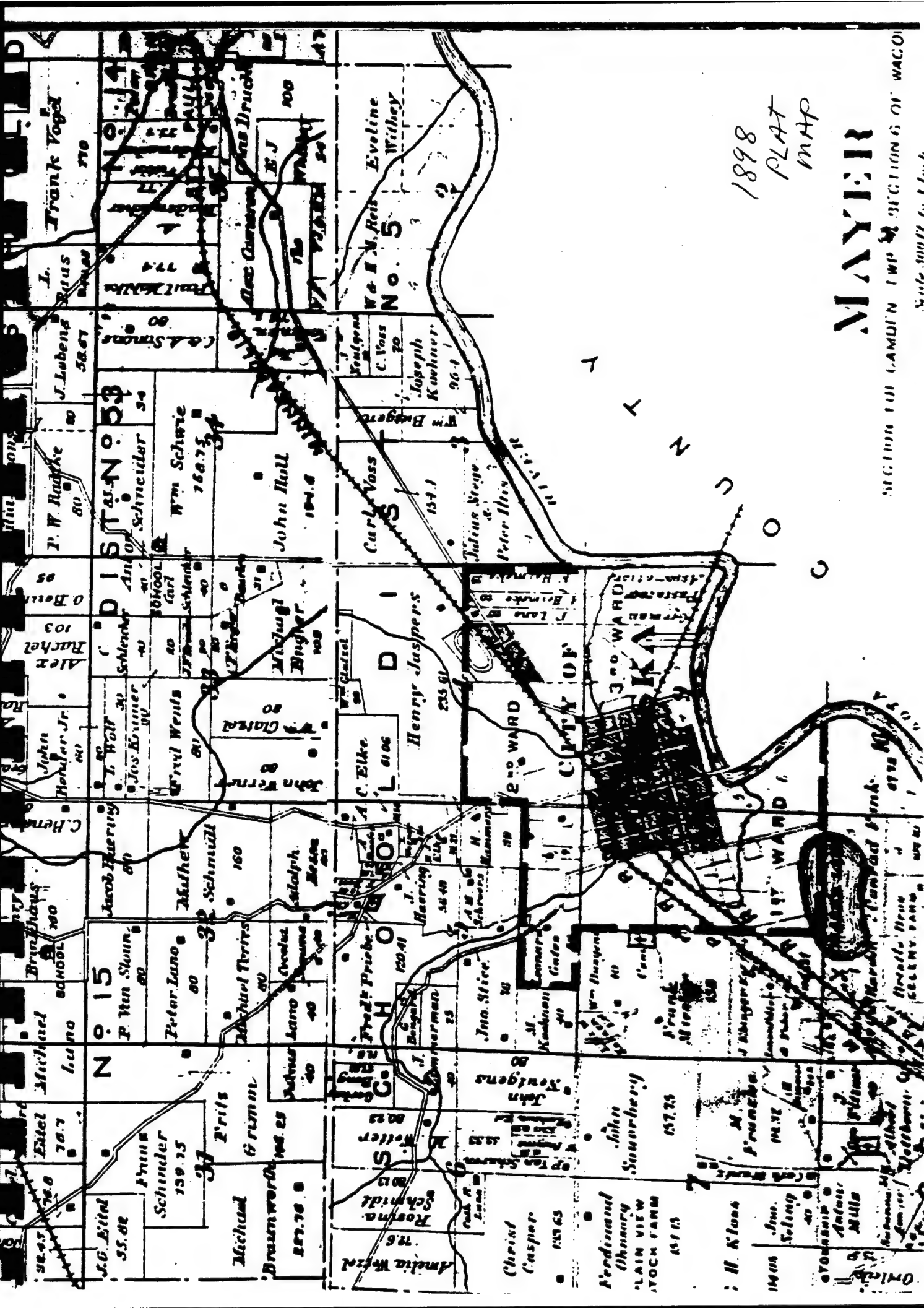
Crystal Sugar  
factory & holding pond/berm

Aerial view of Crystal Sugar Factory, Alaska (1970) MHS  
Photo

## APPENDIX E

[illegible]





# MAYER

1898  
PLAT  
MAP

SECTION 101 CAMDEN TWP 2d SECTION 6 OF WAGON  
Scale 3000 ft to 1 inch



# CAMPER COUNTY SUGAR CO.

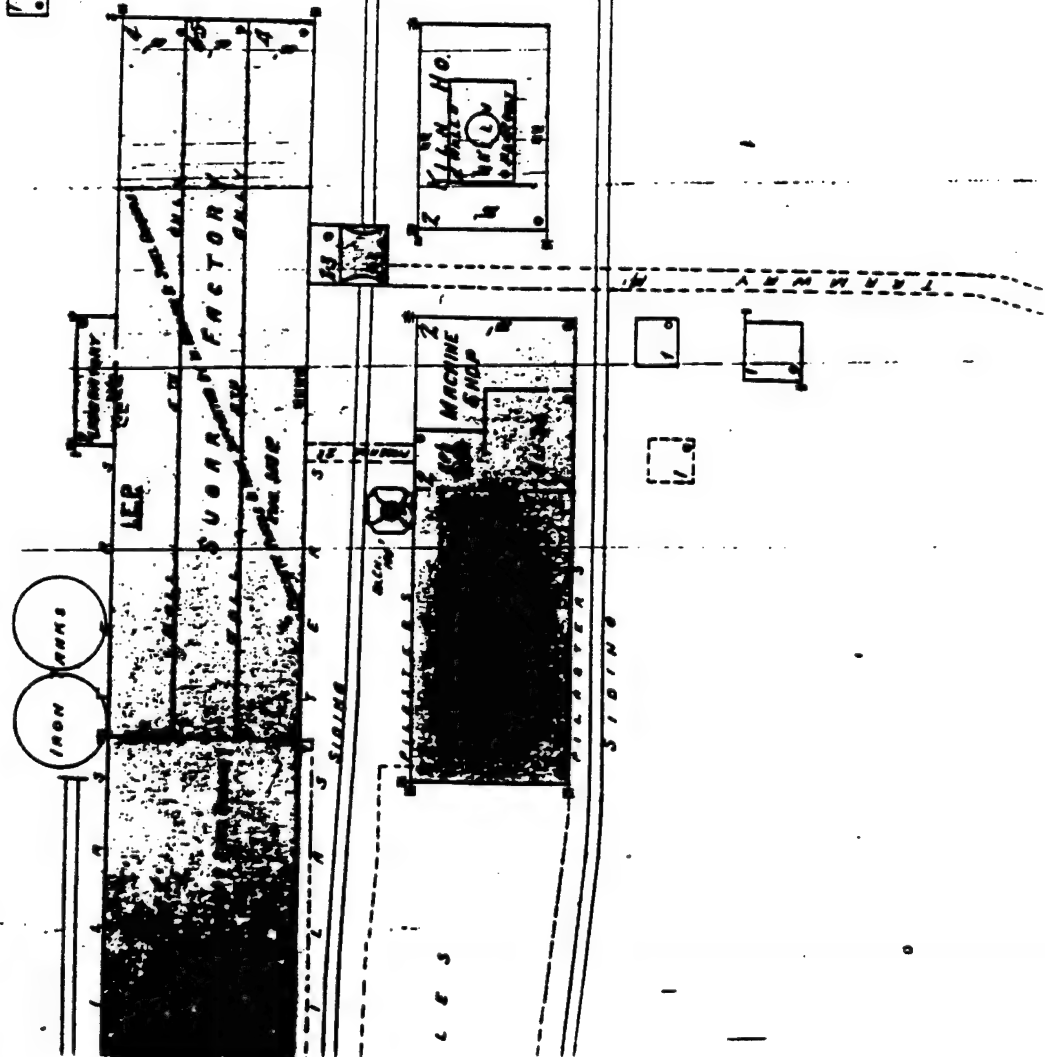
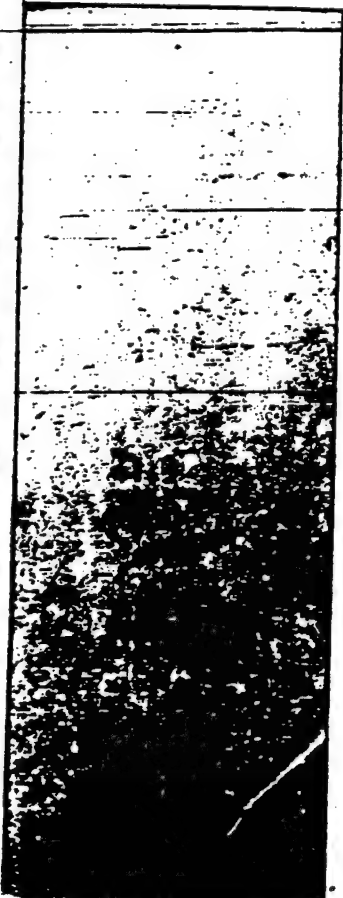
## BEST SUGAR FACTORY

OPERATES 60 DAYS EACH YEAR - MARCH, MARCH & BELLEVILLE  
 WATCHMAN DRIVE - NEWARK - COLORADO - 15 STATIONS - BROWN  
 BROWN'S ELECTRICITY, I.P. - MARY STERILIZER - CORN  
 12 - 3 GALLON - CRYSTALLINE - ESTABLISHED IN 1910  
 NEW BROWN'S - ESTABLISHED IN 1910 - (SUGAR) - BROWN'S  
 NEW BROWN'S - ESTABLISHED IN 1910 - (SUGAR) - BROWN'S

1910  
 Sanborn  
 Insurance  
 Map  
 Detail

Located 1 1/2 Miles N.W. of Cheesepark, O.

0 500 Feet

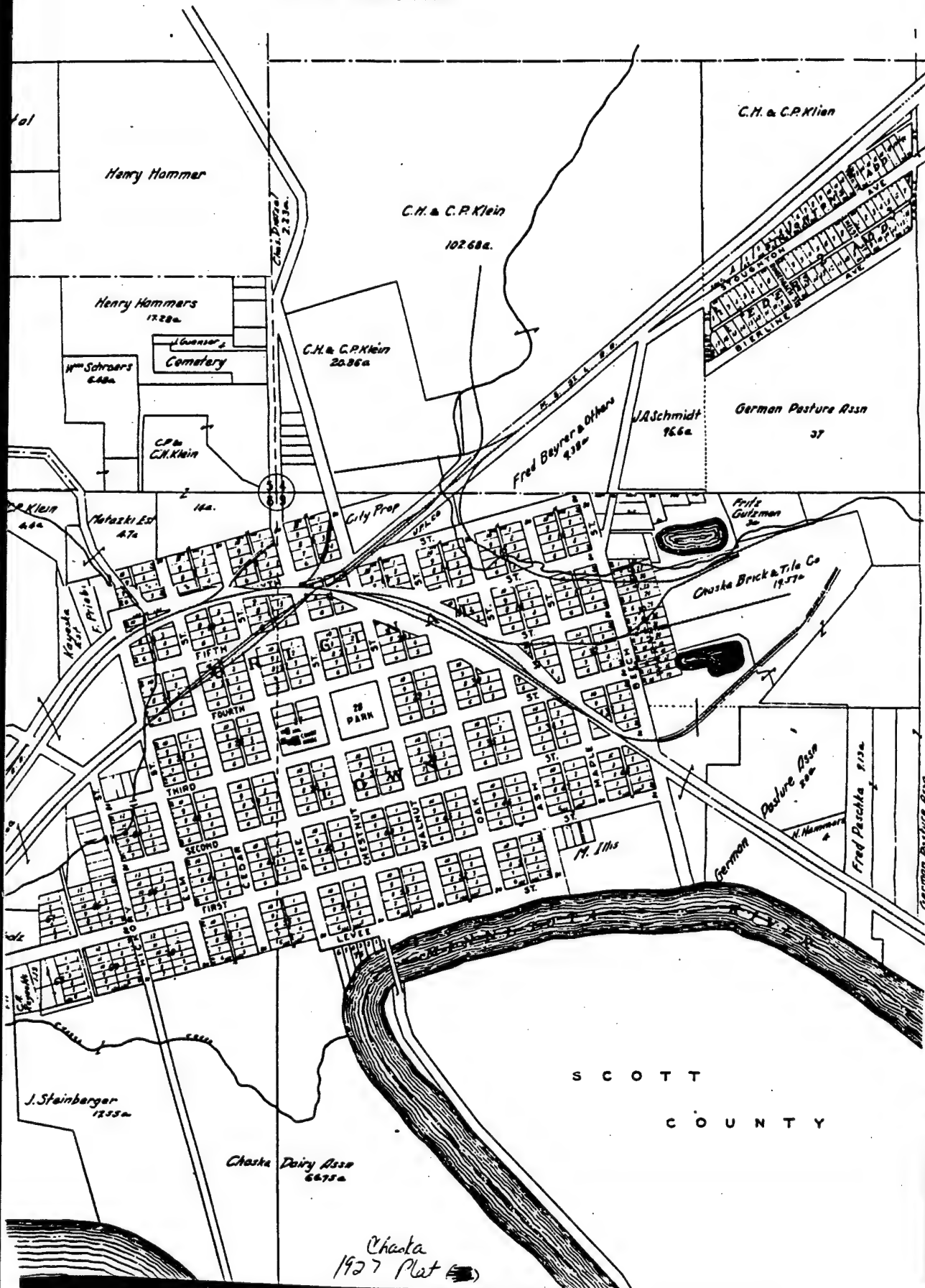


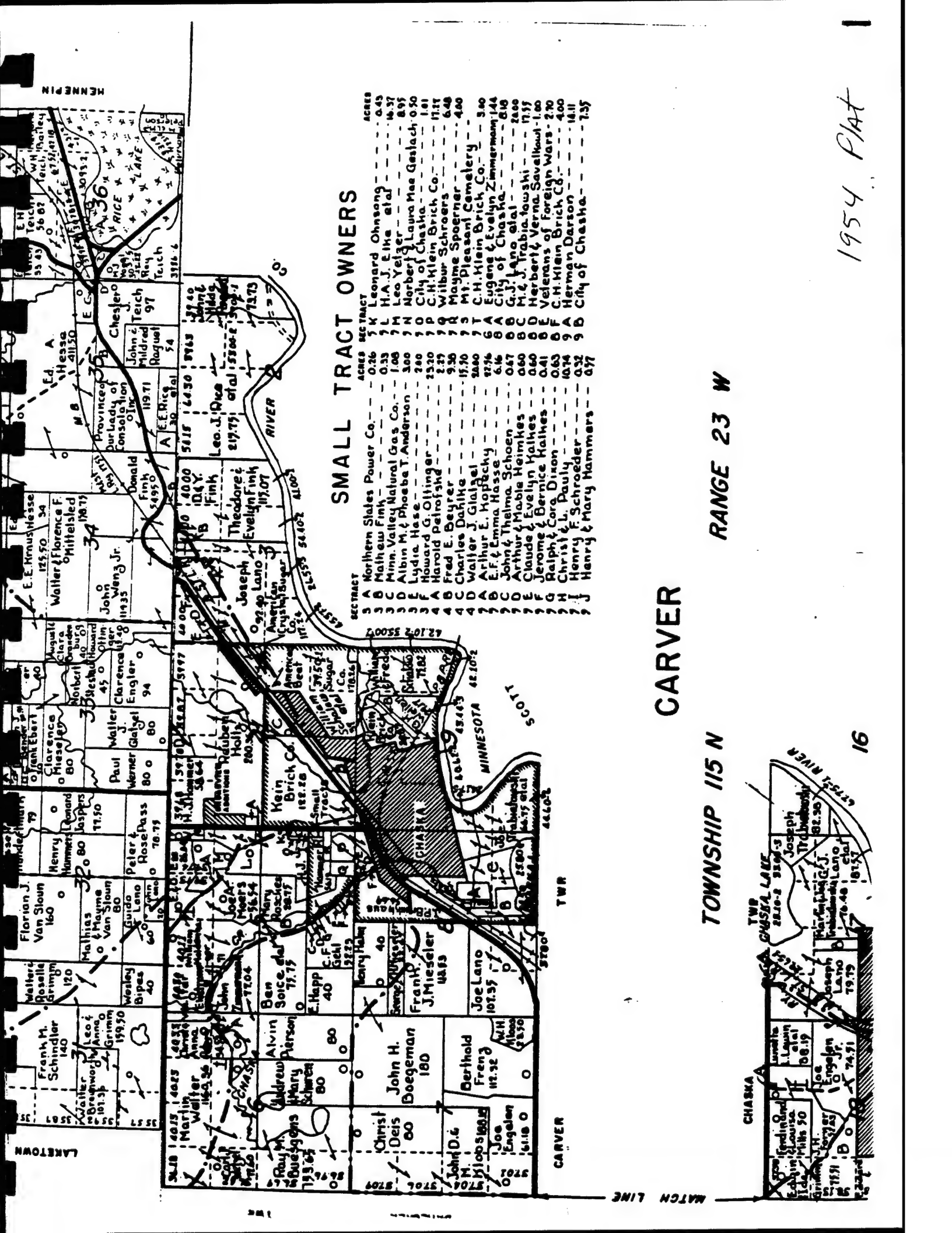
1910 Sanborn  
 Insurance Map  
 Detail of Crystal  
 Sugar Factory

CITY OF  
**CHASKA**  
County Seat of Carver County  
Scale 550 Feet to One Inch

1927 Plat Map  
(2)

1927 Plat





SMALL TRACT OWNERS

TRACT	ACRES	TRACT	ACRES
1 A Northern States Power Co.	0.26	31 K Leonard Ohnsang	0.45
2 B Mathew Fink	0.33	32 L H.A. J. Elke et al	0.37
3 C Minn. Valley Natural Gas Co.	1.08	33 M Leo Yelzer	0.95
4 D Albin M. & Phoebe T. Anderson	3.00	34 N Norbert & Laura Mae Geslach	0.50
5 E Lydia Hase	2.00	35 O City of Chaska	1.81
6 F Howard G. Oltinger	23.20	36 P C.H. Klein Brick Co.	11.11
7 A Harold Petrofsky	2.35	37 Q Wilbur Schroers	6.48
8 B Fred E. Beyrer	9.30	38 R Mayme Spoerner	4.00
9 C Charles Dahlke	15.20	39 M Pleasant Cemetery	3.00
10 D Walter J. Glagel	2.00	40 T C.H. Klein Brick Co.	3.00
11 E F. & Emma Hase	2.76	41 A Eugene & Evelyn Zimmerman	1.44
12 F John & Thelma Schoen	0.67	42 B G.J. Lano et al	2.00
13 G Arthur & Mable Heimkes	0.60	43 C M. & J. Fabia Joushi	1.55
14 H Claude & Evelyn Haltes	0.60	44 D Herbert & Verna Savell	1.00
15 I Jerome & Bernice Haltes	0.41	45 E Veterans of Foreign Wars	2.20
16 J Ralph & Cora Dixon	0.63	46 F C.H. Klein Brick Co.	4.00
17 K Christ L. Pauly	10.24	47 A Herman Larson	14.11
18 L Henry F. Schroeder	0.32	48 B City of Chaska	7.35
19 M Henry & Mary Hammers	0.77		

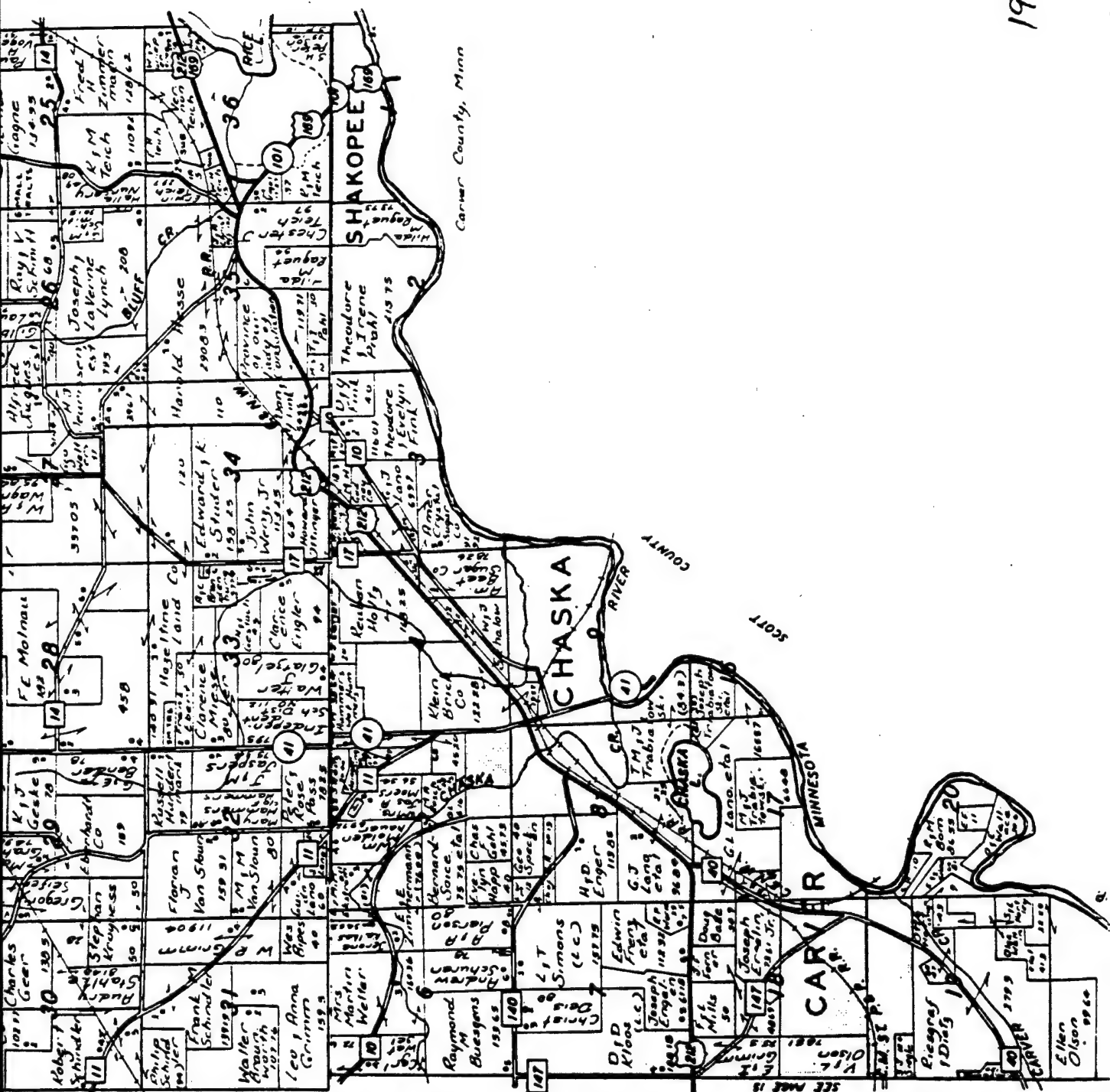
CARVER

TOWNSHIP 115 N

RANGE 23 W

1954 Plat

1961  
plat  
map



Carver County, Minn

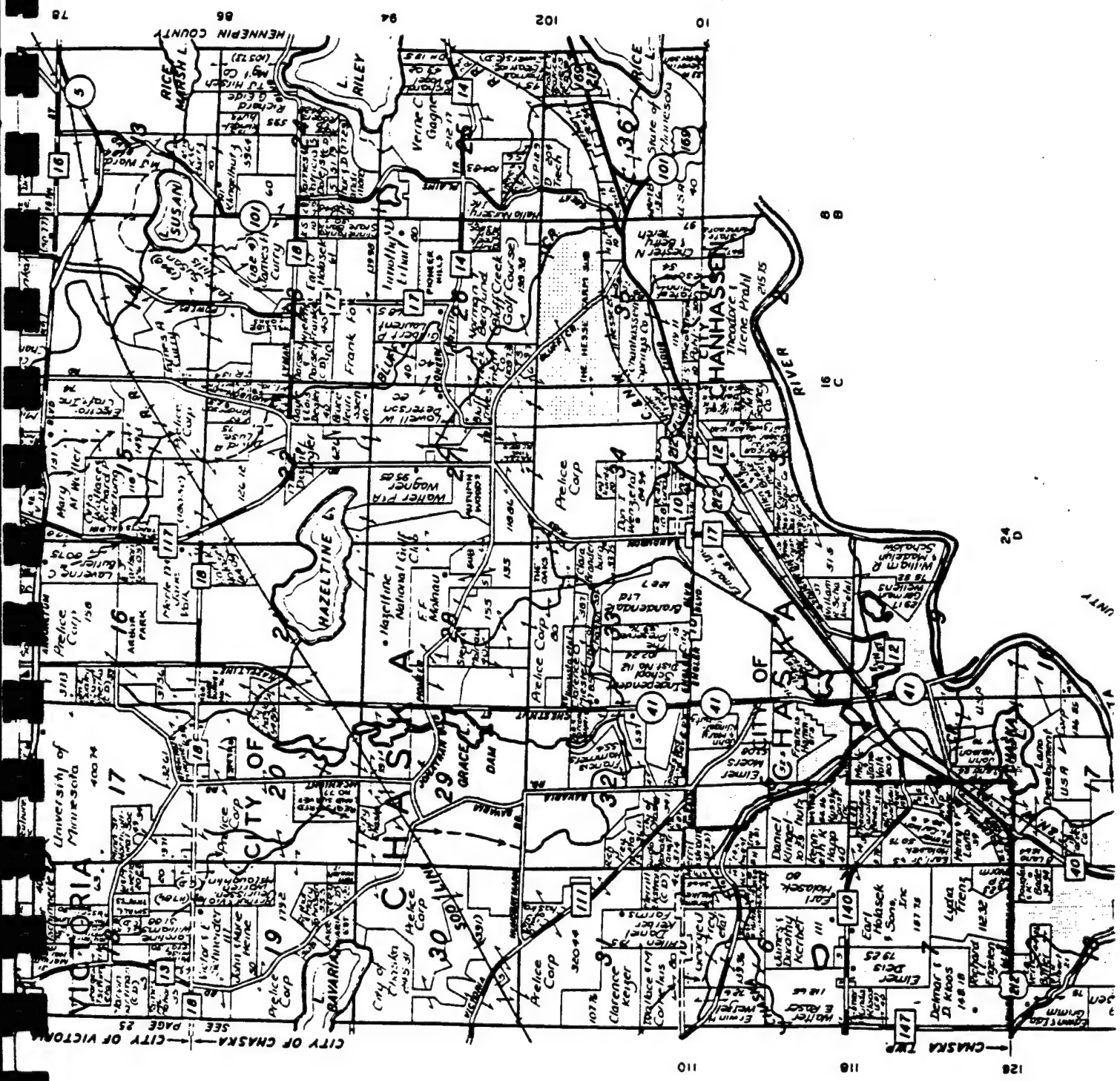
1967 Plat





1987  
Plat  
77x90

1987  
Plat



# AMERICAN CRYSTAL SUGAR COMPANY

CHASKA FACTORY



June 22, 1992

## DEPARTMENT OF THE ARMY

St. Paul District, Corps of Eng.  
180 Kellogg Blvd., Room 1421  
St. Paul, Minnesota 55101-1479

Att: Environmental Resources Branch  
Planning Division

Dear Mr. Whiting:

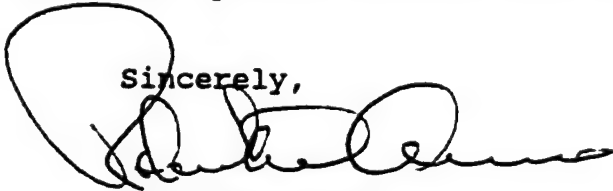
In response to your letter of June 15, 1992 requesting information regarding our present and past land use at Chaska.

The site highlighted in the aerial photograph is of an old lime pond used to discharge waste lime used in the processing of sugar beets. The processing of sugar beets was discontinued in 1971 and the facility has since been used as a liquid sugar and bulk sugar distribution center.

The parcel of land was sold in 1978 to James Lutzweiler who in turn sold the land to Johnson and Haifel in I believe 1986.

If you have any further questions, please call Bob Aune at our Chaska office, 448-2811.

Sincerely,



Robert D. Aune  
Distribution Facility  
Manager





Description  
of Sugar  
Beet Processing  
Operations

from Informational  
Booklet written  
& published  
by Crystal Sugar, Inc.  
at  
Minnesota  
Historical  
Society Library

This booklet has been prepared by American Crystal Sugar Company to acquaint you with the history of sugar and give you the highlights in the production of beet sugar, an all-American product. It describes briefly, in simple terms, the operations of each station, or phase of the operation, in order that you may learn more about the production of this valuable, yet inexpensive energy food which plays such an important part in the American diet.

## Brief Description of the Process

### No. 1. Wet Hopper and Beet Storage—

The beets as received are unloaded for immediate processing from the hopper bottom gondola cars or trucks into the wet hopper. This has a flume of rapidly moving water which conveys the beets into the factory and gives them a preliminary washing. Beets in excess of the factory demands are piled and later removed from the piles to the wet hopper. In territories where severe freezing occurs early, the harvest is expedited to such an extent that large piles of many thousands of tons of beets are accumulated before processing.

### No. 2. Wash House—

The beets from the flumes, on entering the factory, pass through rock catchers and a weed catcher to remove foreign material. They are then lifted out of the flume water by the beet wheel or scroll, and dumped into the beet washer and thoroughly washed with fresh water. Leaving the washer, they are elevated into a hopper on an upper floor.

### No. 3. Cutter Floor and Scales—

The washed beets, after being elevated, are usually weighed through automatic scales into large hoppers from which they are fed into the beet cutters and sliced into thin slices approximately  $\frac{3}{32}$ " square and 3 or 4 inches long. These slices or cosettes, which resemble thinly sliced shoestring potatoes, are conveyed to the diffuser where the sugar is extracted. Each of the slicers is equipped with 48 ridged knives which must be sharpened and reset at frequent intervals. These knives are filed by automatic sharpening machines on this station.

### No. 4. Diffusion - Continuous or Batch—

The sliced beets (cosettes) are conveyed to the diffuser, and in the case of the continuous diffuser, are weighed automatically by the pressure they exert on a calibrated belt. The continuous diffusers are an elaborate arrangement of enclosed conveyors and screens where the cosettes are moved continuously through the diffuser from the entering end to the discharge (pulp) end. The batch diffusers consist of a number of cells or tanks arranged for filling each cell individually and consecutively. Water is introduced at the pulp end, and as it circulates counter-currently through the cosettes toward the last cell filled, it gradually accumulates more and more sugar in solution until, when it leaves the diffuser, it will contain 10% to 13% sugar. This is called raw juice. The pulp, which is substantially exhausted of sugar, goes either to the pulp dryer or to silos to be used for cattle feeding purposes.

"The Production of Sugar From Sugar Beets"  
(1954) American Crystal Sugar Company

P  
377  
76  
542  
**No. 5. Pulp Dryer—**

Nearly all of our factories dry the beet pulp. After the sugar has been extracted from the beets in the diffuser, the residue, beet pulp, is conveyed to the pulp presses where as much water as possible is pressed out of the pulp. The pressed pulp then enters the pulp drying drums where it is dried by direct contact with hot air from the fuel fired furnaces. The dried pulp may be mixed before drying with molasses according to market demands. Whether mixed with molasses or not, it is bagged and sold to stock and dairy farmers as a high nutrition feed.

**No. 6. Lime Kiln—**

The raw juice from the diffuser requires lime for purification and the large quantities of burned lime needed are produced by burning lime rock and coke in vertical lime kilns. The by-product, carbon dioxide gas, is also utilized in the carbonation process.

**No. 7. Slaker Room or Steffen Process—**

Approximately half of the factories are what we refer to as non-Steffen houses, and in such factories the burned lime as it leaves the kiln is conveyed to the lime slaker, a large revolving drum, and slaked to a milky consistency, free of sand and dirt, by constantly agitating the lime in the presence of hot water. The resulting "milk of lime" is pumped to the refining process as needed. In the Steffen's factories, the molasses from the process, which contains approximately 50% sugar that will not crystallize, is diluted, and finely ground lime powder is added to this solution. The lime combines with sugar and the solution is filtered. The resulting cake is washed free of impurities and then introduced into the process as a saccharate. This enables the recovery of sugar from the molasses and at the same time supplies the necessary lime for process.

**No. 8. First, Second, and Third Saturations—**

The raw sugar juice, which is the product of the continuous or batch diffusion, and which contains some non-sugars, is brought to these stations and treated with milk of lime, carbon dioxide gas, and sulfur dioxide gas under carefully and automatically controlled conditions of temperature and alkalinity, in such a manner that substantial amounts of the soluble non-sugars and coloring matter may be precipitated and removed by subsequent settling and filtration.

**No. 9. First Carbonation Filters—**

Where rotary filters are used the juice from the first carbonation enters the Dorr clarifier where the lime and non-sugars from the first carbonation station are allowed to settle out. The clear juice continues in the refining process while the solids which have settled out are picked up on vacuum filters, washed to remove all traces of sugar, and then discharged to the lime storage pond. Other types of filters known as Kellys, and also plate and frame filters, are sometimes used, in which cases the Dorr clarifier is not used.

**No. 10. Plate and Frame Filters—**

The clear juice, leaving carbonation filters or the Dorr clarifying tank, is further chemically treated at the second and third saturation

220003

stations and then brought to the plate and frame filters for filtration through closely woven cotton duck cloths. This same type of filter is also used for a "polishing" filtration of the high grade sugar liquors after evaporation to remove all traces of suspended matter before the sugar is crystallized by boiling under a high vacuum.

#### **No. 11. Evaporators—**

The juice resulting from the purification process is a thin syrup containing from 12% to 14% sugar and about 85% water. The function of the evaporators is to remove a large portion of this water by as inexpensive means as possible. The steam heating the first evaporator is the exhaust steam from the turbo-generator after generating the factory power and light. The vapors produced by the boiling in the first evaporator heats the second, and each succeeding evaporator is heated economically by vapors from the preceding one. Various "vapors" or low-grade steam from these evaporators are also used in other portions of the process for heating and boiling.

#### **No. 12. Vacuum Pans—**

The double filtered and evaporated thick juices are brought to the pan floor for boiling into the final product—sparkling white CRYSTAL SUGAR. This boiling must be done at a low temperature to prevent caramelization; therefore, the boiling is carried out in steam heated vacuum pans. The syrup is drawn into the pan and boiled to the point at which the sugar starts to crystallize. After small crystals of sugar are formed, the speed and length of boiling are carefully controlled to give an end product of just the right sized crystals for the homemaker's consumption.

#### **No. 13. Centrifugals—**

All sugars as they leave the vacuum pan are surrounded with a film of thick syrup or molasses. This film of syrup is removed by running the mixture of sugar and syrup into a rapidly spinning screened basket called a centrifugal. The screen retains the sugar crystals and permits the syrup to be spun off. Final traces of this syrup are then washed from the sugar with a fine spray of hot water and steam. The screen baskets revolve up to 1,600 revolutions per minute and the centrifugals are equipped with automatic timers that regulate the speed, length of time of spinning, amount of wash water used, turn off the power and apply the brake when the spinning is completed.

#### **No. 14. Granulators—**

The white CRYSTAL SUGAR after it is boiled and separated from the adhering syrup and washed, requires drying before it is sacked. This drying is done by tumbling the sugar through a drum in the presence of dry, hot air. This dryer is called a "granulator" because it is used in the drying of granulated sugar.

#### **No. 15. Crystallizers—**

To further the crystallization of sugar from the lower grade syrup after successive vacuum pan boilings, the lower grade "fillmass" is cooled by holding it in a water cooled crystallizer. This cooling and time period is regulated to obtain maximum yield of sugar.

#### **No. 16. Sugar Warehouse—**

The CRYSTAL SUGAR leaving the granulator is sized by screening and is then conveyed to the sugar sacking station. After sacking, the sugar is either sold or transferred to the sugar warehouse for storage until sold. The humidity and temperature of the air in the warehouse is controlled to eliminate caking.

#### **No. 17. Laboratory—**

At each plant a well equipped laboratory with trained personnel maintains a close chemical control at various stages of the process in order to insure efficient operations. The various analyses are made at frequent intervals to assure maximum quality of sugar and reduce processing losses to a minimum.

#### **No. 18. Boiler House—**

All the steam for the power plant and process is produced in the boiler house. Equipment varies considerably, and for each 2,500 tons of beets processed, it will require approximately 400 tons of coal or the equivalent in gas, oil, or lignite.

#### **No. 19. Power Plant—**

Equipment varies widely among the factories, but for the most of them, we use turbo-generators to produce the electricity for the factory motors, lighting, etc.

#### **No. 20. Machine Shop—**

To insure prompt processing of the perishable beet crop, the Company maintains fully equipped and manned welding and machine shops to make emergency and routine repairs.

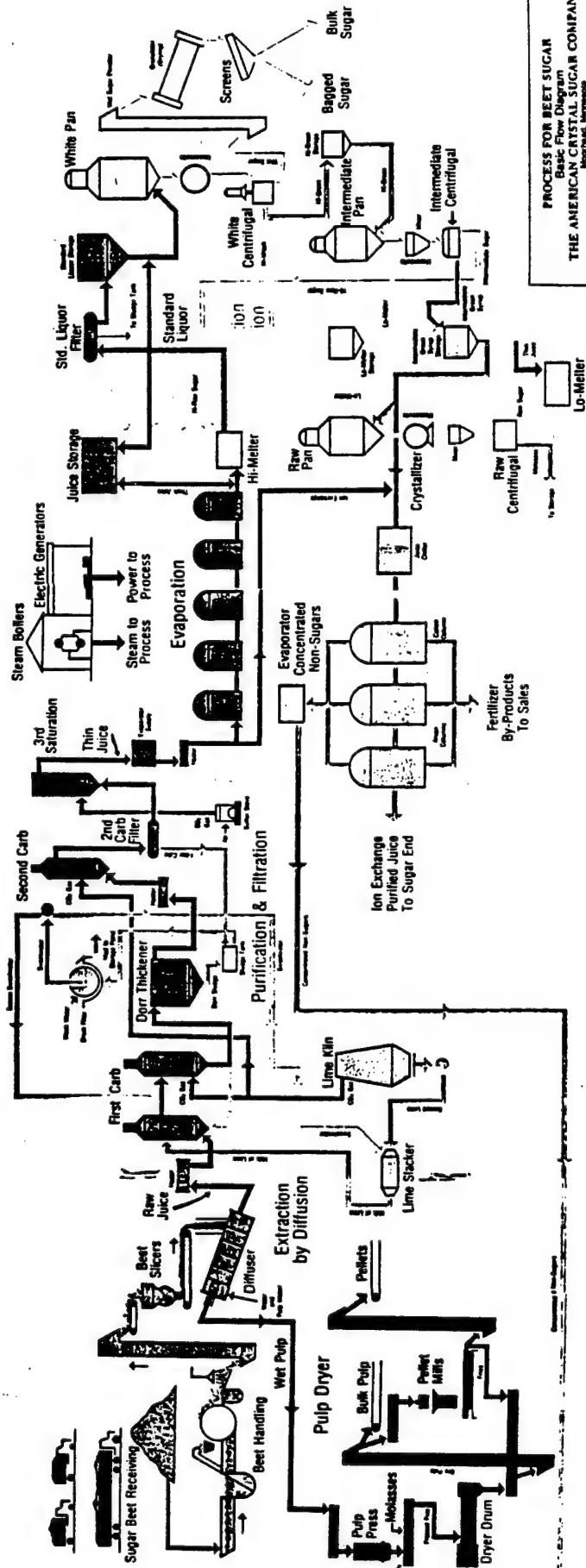
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We hope you have enjoyed and profited from your visit through one of the American Crystal Sugar Company's ten modernly-equipped plants which are located in widely separated agricultural areas.

We also hope that when you think of sugar it will be in terms of CRYSTAL SUGAR and the circle brand that identifies this uniform, dependable, high quality food suitable for all purposes for which sugar is used.

**BUY CRYSTAL SUGAR**

"NOTICE: This material may be protected  
by copyright law (Title 17 U.S. Code)"



PROCESS FOR BEET SUGAR  
 Basic Flow Diagram  
 THE AMERICAN CRYSTAL SUGAR COMPANY  
 Macleod, Minnesota

## **APPENDIX F**



# Minnesota Pollution Control Agency

Celebrating our 25th anniversary and the 20th anniversary of the Clean Water Act

July 21, 1992

Mr. Richard Miller  
U.S. Army Corps of Engineers  
180 East Kellogg Blvd.  
St. Paul, Minnesota 55101

Dear Mr. Miller:

RE: Property Transfer File Evaluation

This letter is in response to your request regarding environmentally contaminated sites in the vicinity of The Levee Work in Chaska, Minnesota. We understand that U.S. Army Corps of Engineers is requesting information regarding the above-referenced property.

Regarding your request, the Minnesota Pollution Control Agency (MPCA) staff has conducted a limited file evaluation for the referenced property or other properties in a one mile radius. The file evaluation included the review of the following:

- (1) EPA - National Priorities List (NPL);
- (2) EPA - Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS);
- (3) MPCA - Permanent List of Priorities (PLP);

List (1) and (3) are the respective federal and state Superfund lists. Sites on these lists are added and deleted by a specific administrative process. Sites on these lists have confirmed contamination and are undergoing various stages of investigation and remediation. List (2) is a national inventory of suspected or confirmed hazardous waste sites. Sites on this list that warrant further investigation or remediation are candidates for further enforcement action under the state and/or federal Superfund programs.

- (4) MPCA - Regulatory Compliance, Hazardous Waste Enforcement Log;
- (5) MPCA - List of Permitted Solid Waste Facilities;
- (6) MPCA - Hazardous Waste Permit Unit Project Identification List;
- (7) MPCA - 1980 Metropolitan Area Waste Disposal Site Inventory;
- (8) MPCA - 1980 Statewide Open Dump Inventory; and
- (9) MPCA - Property Transfer Technical Review Data Base.

Data bases (4) through (9) are used by the MPCA to track various categories of sites. Data base (4), (5), and (6) identify facilities that handle solid or hazardous wastes and may not have experienced any releases. For data bases (7) and (8), releases of contaminants at particular sites may not be yet confirmed or file information is limited. Data base (9) is a registry of properties at which a voluntary investigation has been or is being conducted, with MPCA staff

Mr. Richard Miller

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July 21, 1992

providing technical review of the investigation and any necessary remedial activities. A number of these properties have been investigated and cleaned up or found to not require any cleanup work.

We have no listings under the area indicated for the property. However, our file evaluation has revealed that the following sites are within a one-mile radius of the referenced property:

- Carver Dump, at the end of Main Street, north bank of the Minnesota River, Carver (7); (T115, R23, Sec. 17, Sw 1/4 of Sw 1/4 of NE 1/4, & Sw 1/4)
- Carver Highway Dept. Dump, between Edgemoor Drive and County Road 140, Chaska (7);
- American Crystal Sugar Abandoned Surface Impoundment Site, southeast of the Bierling Avenue and Bold Street intersection, (1070 Stoughton Avenue), Chaska (7);
- Gedneys Pickle Factory Surface Impoundment Site, between Highway 212 & 6th Street, approximately the 11800 block, Chaska (7); and
- Chaska Dump Site, between Willow Street and Beech Street, on the north side of the railroad tracks, Chaska (7).

The file evaluation also included an information retrieval from the Underground Storage Tank Information System data base, which contains information about underground storage, leaks, and spills of petroleum products and/or hazardous substances. It is managed and updated continuously by MPCA staff. Enclosed are:

- A list of leaking underground storage tanks reported within the 55318 zip code area; and
- a list of hazardous substance and/or petroleum product spills that have been reported in Chaska and Carver.

We suggest that you also contact the cities of Chaska and Carver or Carver County regarding the location of pipelines, underground storage tanks, and possible spills of petroleum products and/or hazardous substances which may have occurred in the area.

For concerns regarding Leaking Underground Storage Tanks or Spills of petroleum products and/or hazardous substances reports, please refer to the enclosed "Leak/Spill and Underground Storage Tank File Request Form."

If you have questions regarding sites reported on the following lists, please contact the staff person listed below:

(7/8)	Metro and Statewide Open Dump Inventory	Chris Malec	612/297-5177
(9)	Property Transfer Technical Review	Gerald Stahnke	612/297-1459



Mr. Richard Miller

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July 21, 1992

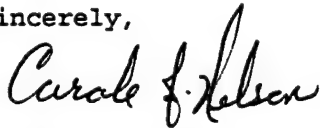
This letter does not constitute an assurance on the part of the MPCA or the state of Minnesota that the property in question is free of any hazardous substances, pollutants, contaminants, or other conditions which may adversely affect the public health, welfare or the environment.

Please be aware that the information provided in this letter is submitted pursuant to the Minnesota Data Practices Act, Minn. Stat. ch. 13 and is not intended to relieve from liability any persons who may otherwise be liable under any provision of state or federal law or regulation. Nor is this letter intended to relieve any persons from responsibility they may have to investigate property prior to becoming involved in a transaction relating to that property. Lastly, you should be aware that the absence of information on a particular parcel of property does not necessarily mean that there are no problems connected with this property.

Minn. Stat. §c 115B.17, subd. 14 (1992) requires that a person requesting this assistance pay the MPCA's cost of providing the assistance. The charge for this file evaluation is \$90.00, which includes two hours spent by staff at a rate of \$45.00 per hour. A bill for this and any other assistance provided this month will be mailed to you at the end of the month.

If you have any questions regarding this letter or if you would like to review our files, please call me at 612/297-1796.

Sincerely,



Carole J. Nelson  
Property Research Specialist  
Program Development Section  
Ground Water and Solid Waste Division

CJN:kra

Enclosures

MINNESOTA POLLUTION CONTROL AGENCY  
HAZARDOUS WASTE DIVISION  
TANKS & SPILLS SECTION

City Leaksite List for Zip Code: 55318

Report Date: July 09, 1992

Facility	Staff Person	ID #
CARVER COUNTY COURTHOUSE		
600 E 4TH ST	Miller, Sandra	5318
CHASKA 55318		
CHASKA TIRE PLUS	Kopltz, Mark	1838
113 E 6TH ST		
CHASKA 55318		
CHASKA TRUCK STATION BUILDING #90921	Millless, Donald	5326
1390 STATE ST		
CHASKA 55318		
HAZELTINE NATIONAL GOLF CLUB	Kopltz, Mark	4822
940 PIONEER TRAIL		Closed
CHASKA 55318		5155
HOLMAN STEEL ERECTION COMPANY		
3220 TERMINAL DRIVE	Holst, David	3927
EAGAN 55318		
JOES TIRE AND GAS		
Hwy 25 & County Rd 10	Moeger, John	1133
WATERTOWN 55318		Closed
KALLSTEAD DIAGNOSTICS	Berryhill, Janet	1092
1000 LAKE HAZELTINE DR		
CHASKA 55318		
LEES UNION 76	Kopltz, Mark	4625
Hwy 212 & 41 - 104 Hwy 212E		
CHASKA 55318		
M A GEDNEY CO	McLain, Chris	3859
2100 SToughton Ave		
CHANHASSEN 55318		
MID-AMERICA BANK	Berryhill, Janet	981
12775 County Rd 43		
CHASKA 55318		
O PETROLEUM	Moeger, John	2660
650 CHESTNUT ST N		Closed
CHASKA 55318		
QUALI TECH INC	McLain, Chris	2429
318 LAKE HAZELTINE DR		
CHASKA 55318		
SALDEN SCHOOL BUS SERVICE INC	Berryhill, Janet	4732
402 W 6TH ST		Closed
CHASKA 55318		309
STOCKWOOD CONDOMINIUM ASSOCIATION		Closed
110251 VILLAGE RD	Kopltz, Mark	
CHASKA 55318		
VALLEY OIL	Berryhill, Janet	
423 CHESTNUT ST		
CHASKA 55318		

----- End of Report -----



# Oil Notifications

## Emergency Response Notification System (ERNS)

### Fact Sheet

Office of Emergency and Remedial Response  
Emergency Response Division OS-210

Quick Reference Fact Sheet

The Emergency Response Notification System (ERNS) is a national computer database which provides the only centralized mechanism for documenting and verifying incident notification information as initially reported to the National Response Center (NRC), the U.S. Environmental Protection Agency (EPA), and to a limited extent, the U.S. Coast Guard (USCG). This initial notification data may be followed up with updated information from various Federal, State and local response authorities, as appropriate. ERNS contains data that can be used to analyze release notifications, support emergency planning efforts, and assist decision makers in developing spill prevention programs. This fact sheet provides summary information on notifications of releases of oil reported in accordance with the Clean Water Act (CWA). Under Section 311 of the CWA, discharges of oil which: 1) cause a sheen to appear on the surface of the water; 2) violate applicable water quality standards; or 3) cause sludge or emulsion to be deposited beneath the surface of the water or adjoining shoreline, must be reported to the NRC.

In the ERNS database, notifications involving the release of oil products are divided into two categories. The first category, "Petroleum," refers to all releases of materials that are petroleum or its by-products. ERNS specifies 64 different petroleum products. These products include: crude oil, heating oil, jet fuel, kerosene, automotive gasoline, and motor oil. Releases involving these 64 types of petroleum-based oil products account for approximately 41% of all the releases reported to ERNS, and 78% of oil and petroleum notifications, made in compliance with the CWA. The second category of oil products in ERNS contains all of the non-petroleum types of oil. There are 156 different non-petroleum types of "Oil" in ERNS. These materials include substances ranging from coconut, sunflower and other edible oils, to anthracene oil and coal. The non-petroleum oil notifications account for approximately 12% of all releases reported to ERNS.

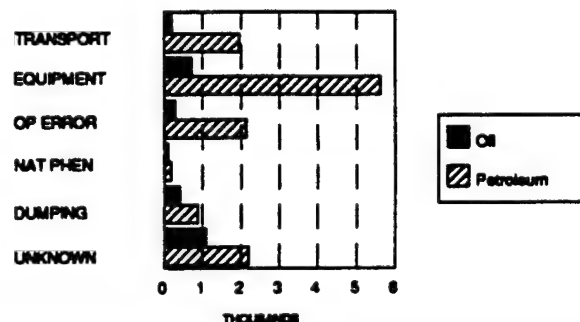
#### NUMBER OF OIL AND PETROLEUM NOTIFICATIONS RECEIVED ANNUALLY\*

Type of Release	1987	1988	1989	1990	1991
"Petroleum" Notifications	12,550	12,399	12,567	14,085	14,520
"Oil" Notifications	3,027	2,768	3,507	4,761	4,744
Total Oil/Petroleum Notifications	15,577	15,167	16,074	18,846	19,264
Total Number of ERNS Notifications	28,677	29,874	34,104	34,259	35,653

Number of Oil/Petroleum Notification by Cause\*  
(1987 - 1991)

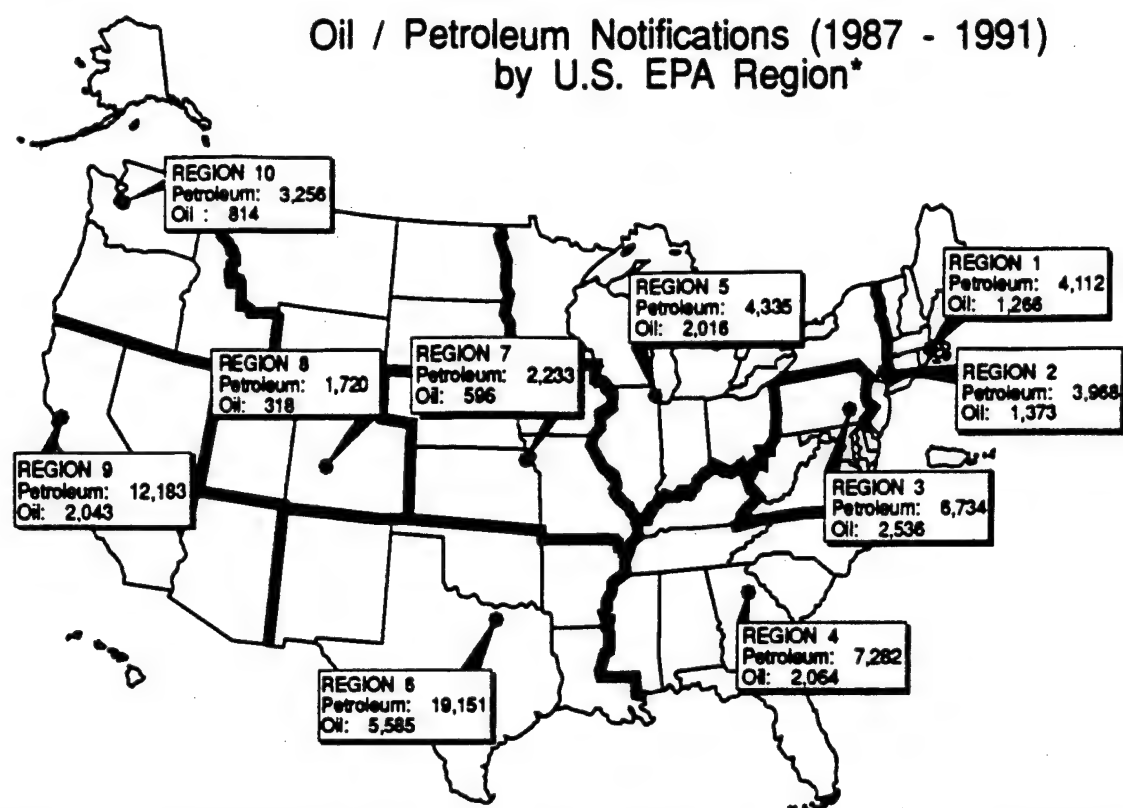
The following chart is a graphical representation of the distribution of oil and petroleum releases among the six "causes of release" in ERNS. The six causes are transportation accident, equipment failure, operator error, natural phenomenon, dumping, and unknown.

As the chart reveals, petroleum releases outnumber oil releases in all categories, by more than 2 to 1. Additionally, petroleum releases caused by equipment failure represent the largest number of recorded releases in ERNS.



\*All numbers are based on initial notifications to the Federal government and may not have been verified.

The map below shows the number of oil and petroleum releases for each of the ten EPA regions. The largest numbers of reported oil/petroleum releases occurred in Regions 6 and 9. The data used in the map are cumulative, from 1987-1991.



The following table shows the size distribution of oil and petroleum notifications. ERNS data reveal that the largest number of notifications for both categories involve releases less than 1,000 gallons. Notifications involving releases in quantities greater than 100,000 gallons represent an average of .2% and .1%, for petroleum and oil respectively.

**NUMBER OF OIL/PETROLEUM NOTIFICATIONS BY SIZE \***

		1987	1988	1989	1990	1991
No Quantity Reported	Oil	1,230	1,189	0	0	0
	Petroleum	1,364	1,283	3	2	0
Less than 1,000 gallons	Oil	1,662	1,432	3,372	4,635	4,636
	Petroleum	10,001	10,052	11,424	12,895	13,321
1,000- 9,999 gallons	Oil	102	119	109	95	83
	Petroleum	980	878	938	980	998
10,000- 99,999 gallons	Oil	26	17	22	23	23
	Petroleum	177	163	170	184	181
100,000 gallons or greater	Oil	7	11	4	8	2
	Petroleum	28	23	32	24	20

For further information regarding ERNS, call the ERNS information line at (202) 260-2342, or write the ERNS Manager, U.S. EPA, at OS-210, 401 M St., SW, Washington, DC 20460.

\*All numbers are based on initial notifications to the Federal government and may not have been verified.



United States  
Environmental  
Protection Agency

Office of Solid Waste  
and Emergency  
Response

Publication 9360.0-29FS  
April 1992

# An Overview of ERNS

## Emergency Response Notification System (ERNS) Fact Sheet

Office of Emergency and Remedial Response  
Emergency Response Division OS-210

Quick Reference Fact Sheet

The Emergency Response Notification System (ERNS) is a national computer database used to store information on releases of oil and hazardous substances. The ERNS program is a cooperative data sharing effort among the Environmental Protection Agency (EPA) Headquarters, the Department of Transportation (DOT) Research and Special Programs Administration's John A. Volpe National Transportation Systems Center (VNTSC), the ten EPA Regions, and the National Response Center (NRC). EPA Headquarters manages and funds ERNS, and the VNTSC provides operation and maintenance support through an interagency agreement with EPA. ERNS provides the most comprehensive data compiled on release notifications of oil and hazardous substances in the United States. Since its inception in 1986, more than 160,000 release notifications have been entered into ERNS.

### RELEASE NOTIFICATIONS IN ERNS\*

Notification Type:	1987	1988	1989	1990	1991
CERCLA	4,582	5,060	6,554	6,174	5,885
Oil	15,577	15,167	16,074	18,846	19,264
Other	8,518	9,647	11,476	9,239	10,504
Total for Year	28,677	29,874	34,104	34,259	35,653

CERCLA: Substances designated as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, section 103.

Oil: Any oil discharge which: 1) causes a sheen to appear on the surface of the water; 2) violates applicable water quality standards; or 3) causes sludge or emulsion to be deposited beneath the surface of the water or upon the adjoining shorelines, reported in accordance with section 311 of the CWA.

Other: This category includes non-CERCLA, non-oil substances along with substances that could not be identified at the time of the release.

### HOW ARE NOTIFICATIONS COLLECTED IN ERNS?

The ERNS data are captured electronically when a release is reported to the NRC or EPA. When a release report is submitted to Federal authorities, the individual reporting the release is asked a series of questions concerning the release. This information is then immediately transferred to the appropriate Federal response authority. For example, when the NRC receives the initial notification of a release, the information is immediately transmitted to the appropriate Federal On-Scene Coordinator (OSC) in an EPA Regional Office or Coast Guard District Office, depending upon the release location. In some cases reports are made directly to the EPA or United States Coast Guard (USCG) offices, at which time the Federal response authorities make a response determination. The OSC then relays the information to the appropriate State and local response authorities, as necessary.

Information concerning all releases originally reported to the NRC and EPA Regional Offices is entered into local computers and transmitted electronically from the NRC or EPA Regional Office to the VNTSC, where it becomes part of the ERNS national database. Each EPA Region maintains its own Region-specific database, which is a subset of the national database.

\* All numbers are based on initial notification to the Federal government and may not have been verified.

## WHAT INFORMATION IS IN ERNS?

Information is recorded in ERNS when a release is initially reported to the Federal government. These initial notifications contain the preliminary release information available at the time of the release. The information in ERNS is "unverified" because at the time of the release, some of the information reported to the Federal government may be incomplete or inaccurate. Depending upon the severity of the release and the response actions taken, the EPA or Coast Guard OSC obtains further information on the release by assisting at the site or discussing the incident with State, local, or other response officials. Where notification information is verified, more detailed data on the release may be added to ERNS, including information related to response actions. Often, however, the only information found in ERNS is information derived from the initial notification.

## UNDER WHAT AUTHORITIES ARE THE NOTIFICATIONS IN ERNS REPORTED?

There are primarily five Federal statutes that require release reporting. Part or all of the information from these reports may be collected in ERNS. These statutes and their resulting regulations, their citations, and their relationship to ERNS are shown in the following table:

### APPLICABLE FEDERAL STATUTES/REGULATIONS:

Statute	Cite	Description
CERCLA Section 103	40 CFR, Part 302, Section 302.6	This section requires that releases of hazardous substances which meet or exceed their reportable quantity (RQ) be reported to the NRC, who in turn will notify the appropriate Federal On-Scene Coordinator (OSC). These releases account for 17% of all the notifications in ERNS.
SARA Title III Section 304	40 CFR, Part 355	In this section, the release of an RQ or more, of a CERCLA hazardous substance or a SARA extremely hazardous substance, must be reported to Federal authorities. Non-CERCLA EHS releases must be reported to the State Emergency Response Commission (SERC) of any state likely to be affected by the release and to the Community Emergency Coordinator for the Local Emergency Planning Committee (LEPC) of any area likely to be affected by the release. It should be noted that few of these notifications are incorporated into the ERNS database. Transportation-related releases must be reported to the 911 emergency number or, in the absence of a 911 number, to a telephone operator.
CWA Section 311	40 CFR, Part 110, Section 110.10	This Section requires persons who release oil and hazardous substances to report the release to the appropriate Federal Agency, who will then immediately notify the appropriate state agency of any state which may be affected by the discharge. In the oil discharge regulations promulgated under this act, EPA establishes 3 categories of reportable discharges of oil. A discharge must be immediately reported to the NRC if it: 1) causes a sheen to appear on the surface of the water; 2) violates applicable water quality standards; or 3) causes sludge or emulsion to be deposited beneath the surface of the water or upon the adjoining shorelines. Oil notifications account for 52% of all notifications in ERNS.
CWA Section 311(b)(3)	40 CFR, Part 300, Sections 300.125, 300.300, 300.405	The NCP regulations require that oil or hazardous substance releases which violate the CWA be immediately reported to the NRC. If direct reporting to the NRC is not practicable, reports may be made to the Coast Guard or EPA designated OSC for the geographic area in which the discharge occurred.
HMTA Section 1808(b)	40 CFR, Subchapter C, Section 171.15	The HMTA requires dischargers to notify the NRC if as a direct result of the release: (1) a person is killed; (2) a person receives injuries requiring hospitalization; (3) estimated carrier or other damage exceeds \$50,000; (4) an evacuation of the general public occurs lasting one or more hours; (5) one or more major transportation arteries or facilities are closed or shut down for one hour or more; or (6) the operational flight pattern or routine of an aircraft is altered. Although these releases are reported under DOT authority, they may also be subject to EPA authority.

CERCLA:	The Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended.
SARA:	The Superfund Amendments and Reauthorization Act of 1986, as amended.
CWA:	The Clean Water Act of 1972, as amended.
HMTA:	The Hazardous Material Transportation Act of 1974, as amended.
NCP:	The National Oil and Hazardous Substances Pollution Contingency Plan, as published under section 311(d) of the CWA, as amended by section 4201(b) of the Oil Pollution Act of 1990, or revised under section 105 of CERCLA.



## WHAT IS ERNS USED FOR?

The primary purpose of ERNS is to standardize and collect notifications made to the Federal government of releases of oil and hazardous substances. These notifications are used by OSCs during, before and after data are entered into ERNS, to determine an appropriate Federal response action. Currently, ERNS data are used to assist decision makers in solving emergency response and release prevention issues. Specific examples of ERNS data applications include:

- Guidance and Regulatory Development
- Responses to Congressional Inquiries
- Response Preparedness
- Compliance and Enforcement Support
- Statistical and Trend Analysis
- Environmental Planning
- Spill Prevention Programs
- Legal Analyses
- Property Transfers/Site Audits
- Academic Research

## WHAT TYPES OF ERNS DATA ARE AVAILABLE?

ERNS data is available to the public in various forms including computerized copies, printouts, summarized release totals, or 6250 BPI magnetic data tapes. Each of these formats serve a different purpose; the decision regarding what type of information is chosen depends on the individual needs of the requestor. Cost for providing ERNS data is determined based on the materials used and the time and effort expended to fill the request. General descriptions of the information formats are provided below:

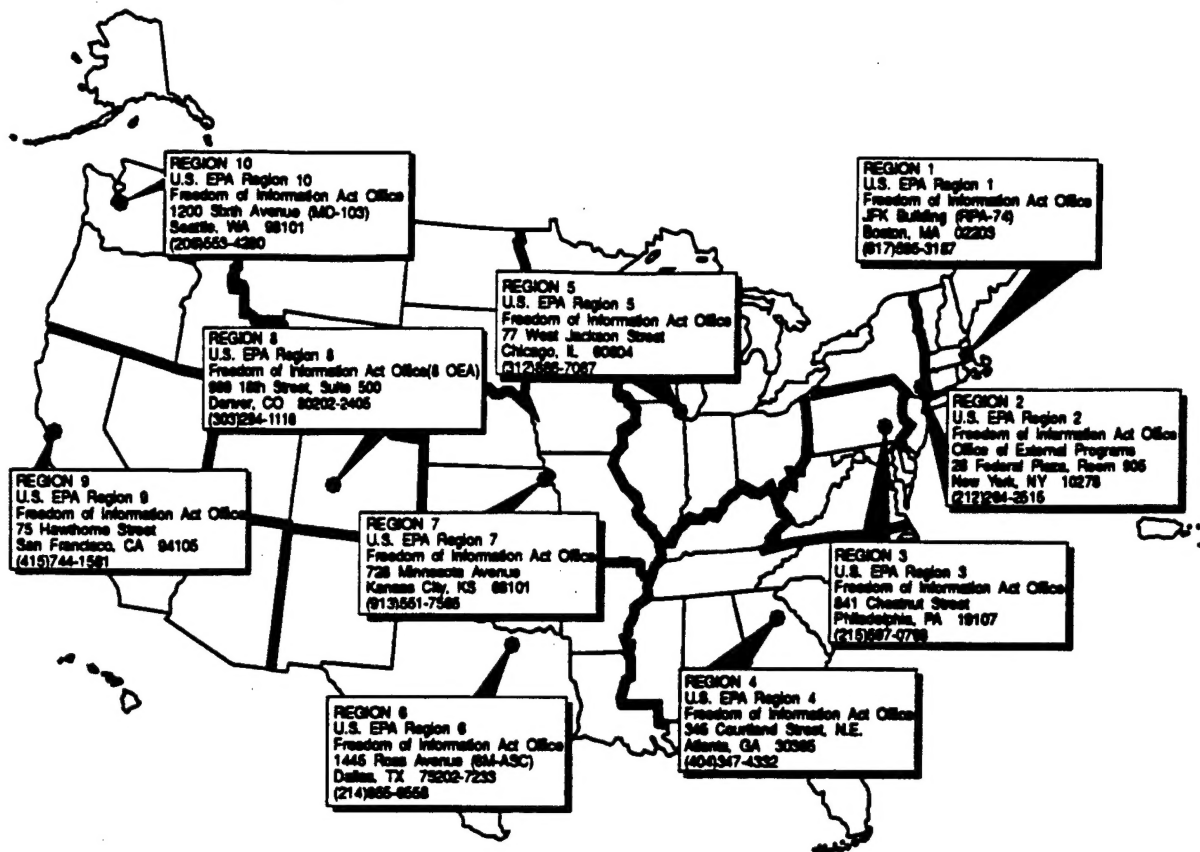
- **Standard ERNS Reports:** These reports provide a one page summary of the releases as reported to the Federal government. Standard ERNS reports can be obtained on a floppy disk or as a computer printout, depending upon the number of reports requested. Generally, these reports are best for providing specific information on a small subset of data. Searches best suited for this format include: searching for specific report numbers, searching for specific release dates, searching for specific dischargers, searching for information on specific chemicals, and searching for information on the county, city or address of the release.
- **Summary Release Totals:** This information is best suited for analyzing trends, or making comparisons of broad groups. Summary Information reports are not as detailed as the ERNS reports, but offer the requestor a broad overview of data. Examples of uses for Summary Information reports include: Comparisons of the number of release reports between States/calendar years/EPA Regions or cities, comparison of the number of release reports for broad chemical groups, and release reports categorized by the quantity of the material released.
- **Magnetic Data Tapes:** These tapes can be obtained in either ASCII or EBCDIC formats for each year in the database. Included with each tape is a data dictionary which references terms used in the ERNS national database and a Tapeout log showing record and block lengths including the number of records and blocks contained in each file. These tapes are typically provided to requestors who have extensive needs for ERNS data, and who have the hardware necessary to operate magnetic data tapes.

## HOW CAN ERNS DATA BE OBTAINED?

Information on the ERNS system and data may be obtained by calling the ERNS Information Line at (202) 260-2342, or by contacting the Freedom of Information Act (FOIA) Officer in the specific EPA Region of interest. Addresses and telephone numbers of the EPA Regional FOIA offices are provided below. For more extensive materials, write to the EPA Headquarters FOIA Officer at:

U.S. Environmental Protection Agency  
Freedom of Information Act Office (A-101)  
401 M Street, SW  
Washington, DC 20460

## EPA Regional Contacts for ERNS Information



United States  
Environmental Protection  
Agency (OS-120)  
Washington, DC 20460

Official Business  
Penalty for Private Use  
\$300



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### Incident Identification

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Source Agency : NRC    EPA Region :    Report Number : 95269

Company : MINNEGASCO  
Addr : 201 S 7TH ST

City : MINNEAPOLIS    St : MN    Zip : 55412

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### Material Reported

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CHRIS Code : ONG    CAS Number :  
Material Spilled : NATURAL GAS    Qty :    0.00 Units : UNK  
Media spill released into : air

Description :  
5/8 INCH GAS SERVICE LINE / MOBILE HOME EXPLODED, CAUSE HAS NOT YET  
BEEN DETERMINED.

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### Incident Location

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Spill Date : 11/05/1991  
County : CARVER    City : CHASKA  
State : MN    Zip :  
Location :  
130 JUDITH DRIVE

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### Cause/Source

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Reported Cause : other  
Source : pipeline

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### Damages/Actions

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Injuries :    Deaths :    Evacuations :  
Damages :    Damage Cost :  
Action :  
FIRE DEPT SECURED THE GAS VALVE AND PUT OUT THE TRAILER FIRE. THE LINE  
WAS SECURED TO RUN TESTS FOR LEAKAGE.

\*\* Note: This information is based on initial notification data, and may be  
subject to verification. \*\*

This search was performed on 07/21/1992 and reflects information as of this date.